PRINTRONIX®

IGP®/VGL Emulation for Thermal Printers
Code V™ Graphics Language
Programmer's Reference Manual

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PRINTRONIX®

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1 *Overview*

About this Manual

This manual is divided into chapters that contain all the information required to use the IGP®/VGL® Emulation. Use this manual in conjunction with your printer *User's Manual* for complete printer-VGL compatibility.

Warnings and Special Information

Information requiring special attention is highlighted under special headings. Always read and comply with this information. The heading reveals the nature of the information:

WARNING **Conditions that could cause you physical harm as well as damage the equipment.**

CAUTION **Conditions that indicate the possiblity of damage to a program, device, system, or data.**

IMPORTANT **Information vital to proper operation of the printer.**

NOTE: Provides helpful tips about printer operation and maintenance.

Features

The Code V Graphics Language (VGL) is the QMS compatible Intelligent Graphics Printing software designed for Printronix thermal, line matrix and L7032 printers. VGL emulates the QMS Code V Version II programming language to produce on-line forms, barcodes, and alphanumeric text generation in both normal and high resolution. The VGL graphics processing features are detailed below.

Online Form and Label Generation

On-Line Form and Label Generation makes it easy to create forms or labels with the “preprinted” look for each application. VGL programs control all graphics functions, dramatically reducing host computer programming and processing time. Graphics capabilities include boxes, vertical, horizontal, solid and dashed lines in normal or high resolution with a variety of thickness, logos, and special alphanumeric print features. Forms and graphic designs can be duplicated horizontally and vertically.

Variable Barcodes

Variable Barcodes allow the barcode for your application to print easily with standard or user-defined ratios in vertical or horizontal orientations, in normal or high resolution. Available barcodes are: Australian 4-State; Codabar; Code 39; Code 128 with Subsets A, B, and C; Code 93; Data Matrix; EAN 8; EAN 13; German Interleaved 2 of 5; Identicon; Intelligent Mail 4-State; Interleaved 2 of 5; Maxicode; MSI; Planet; POSTNET; Royal Mail; Telepen; UCC/EAN-128; UPC-A; UPC-E; UPS 11 and UPC Shipping.

. POSTNET is available only in horizontal direction. Impact printers include a dark print mode for darker, high-contrast barcodes. The IBARC barcode command prints barcodes in four orientations: horizontal, rotated 90, rotated 180 or rotated 270 degrees.
See Table 21 on page 167 for a complete list of barcodes.

Expanded and Compressed Print

Expanded and Compressed Print draws attention where needed. Alphanumeric height and width are controlled independently for a tremendous range of character sizes up to 9.9 inches wide and tall. Six compressed print sizes are available: 12, 13.33, 15, 17.65, 20, and 24 cpi (characters per inch), permitting up to 204 columns in an 8.5-inch printed area (24 cpi). In high resolution mode, characters can be sized and positioned to hundredth of an inch specification.

Rotated Alphanumerics

Rotated Alphanumerics permit new concepts in form design. Normal, expanded, and compressed character strings can be rotated 90 degrees clockwise, counterclockwise, or printed upside down.

Logos

Logos are easily created using alphanumeric commands and a variety of print and shading features, providing a “customized” appearance for forms, reports, and labels. The registered trademark, copyright, TUV®, GS-Mark, UL®, and CSA® symbols are provided as standard designs on the VGL, and you can also define custom symbols.

Reversed and Shaded Print

Reverse and Shaded Print permit highlighting and contrasting by printing white characters on a dark background or white characters on a gray, shaded background. Various levels or patterns of gray shading and reverse printing can be combined with the many other print features to create distinctive designs.

Automatic Increment/Decrement Capability

Automatic Increment/Decrement Capability allows batch form processing. Individual numeric and barcode data fields can be identified and automatically incremented or decremented by any amount, beginning from any specified number.

Multinational and International Character Sets

Multinational and International Character Sets provide you with access to predefined international character sets, each 96 characters in length. The Multinational Character Set also allows you to create your own character sets using characters defined and stored in memory.

New or Different Features for the VGL

VGL introduces the QMS-compatible Intelligent Graphics Printing software to the Printronix thermal printer environment. Certain variations due to the line matrix versus thermal printing technology change the way the VGL operates in several ways.

- The “dots” parameter in a command is based on a 60 dots-per-inch (dpi) horizontal by 72 dpi vertical grid. In normal resolution mode, this grid is converted to the equivalent number of dots on a high-density, thermal print engine. For example, 1 horizontal dot on a line matrix printer equals 5 dots on a 300 X 300 dpi thermal printer. In high resolution mode, however, size and position parameters are specified in inches.
- Thermal and laser printers cannot produce half-dots. Therefore, for same-cpi fonts on a thermal or laser printer, full dot fonts in draft print and half-dot fonts in correspondence print would produce the same number of dots.

- Dark print, used to produce darker looking graphic elements (e.g., barcodes, shading masks, reverse print, etc.) is a function of line matrix printers only. The darker looking print is produced by overstriking. Thermal and laser printers ignore dark print commands.

Modes of Operation

Normal Mode

VGL has two basic modes of operation: Normal and Graphics. In Normal Mode, all characters and commands are passed directly through VGL to the Line Printer Plus® Emulation without processing, except to check for the VGL Special Function Control Code (SFCC) and Graphics Mode command.

All the standard Line Printer Plus Emulation features (such as EVFU, elongated characters, compressed print, plot mode, etc.) are still available when VGL is in Normal Mode. However, when VGL receives a Graphics Mode command, the VGL changes to the Graphics Mode and assumes control of the printer.

Graphics Mode

In Graphics Mode, all VGL functions are available. The standard graphics commands provide features such as underline print, horizontal and vertical duplication, dynamic forms, graphics plotting, and vertical formatting. A complete listing of all standard graphics commands is provided in the “Commands” chapter.

Extended Graphics Mode

In addition to the standard graphics commands, the VGL Graphics Mode has an extended graphics command set, providing more specific graphic features for forms and labels. Alphanumeric commands, boxes, lines, logos, shading, special fonts, and all barcodes are part of the extended graphics command set. Again, complete extended graphics command information is provided in the “Commands” chapter.

VGL also supports the QMS Version II commands (ILOGO, IPEXP, IISO, IBARC, IREPH, IREPV, IFONT,S, IHEX, IPLOT, IFORM,C, IFORM,D, IFORM,E, IFORM,L, and IFORM,R) as well as the original commands performing the same or similar functions to those in Version II. For example, the Horizontal Duplication command (**S**) is still available, while an enhanced Horizontal Duplication command (**IREPH,**) is now available with Version II.

Extended Graphics/High Resolution Mode

Within Graphics Mode, there is an additional high resolution mode called Extended Graphics/High Resolution Mode. In this mode, you can access the extended graphics commands as well as new commands designed to achieve enhanced resolution for thermal printing.

Extended Graphics/High Resolution Mode allows you to specify graphic elements and characters in expanded size and position parameters. Graphic elements (lines, boxes, and forms) can now be defined in increments of one thousandth of an inch. Characters can now be specified in increments of one hundredth of an inch. As a result of these enhancements, you can print forms and labels that include high resolution text, graphics and barcodes.

The actual positioning and size, however, can be only as “fine” as your printer resolution (dpi). For example, a graphic position change of 0.001, 0.002, or 0.003 would result in one printer dot at 300 dpi (1 - .0033 inches). Also, because the actual height of characters changes in increments of seven printer dots (0.0233 inches at 300 dpi), a size specification of 0.01 inch or 0.02 inch would result in a character of the same size.

Configuring VGL with the Control Panel

Matching certain printer operational settings to those of the host computer is known as printer configuration. The settings, or configuration parameters, such as selecting the host interface, parallel/serial data input and file management, are adjusted according to the printer function switch descriptions in your printer's *User's Manual*. Configure VGL in the same way you would configure the printer for other features.

You can select VGL default parameters directly from the control panel as explained in your *User's Manual*, or by control codes as explained in the “Commands” chapter. Your *User's Manual* also contains detailed configuration menus and diagrams, as well as descriptions of each configuration parameter available with your printer.

2 *Commands*

Modes of Operation

VGL has two basic modes of operation: Normal mode and Graphics mode. In Normal mode, the data stream passes unchanged to the printer until the Special Function Control Code (SFCC) and Graphics Mode Enable command are detected, indicating that special Graphics mode functions follow. All of the printer standard features operate in Normal mode (such as the EVFU, plot, hex dump) and the printer responds to command and control codes as described in the printer *User's Manual.*

In Graphics mode, you can generate alphanumeric characters, graphic components and barcodes. Once the Graphics mode is enabled, specific command sequences are used to generate a variety of graphics. The command parameters define height, width, location, and type of graphic (boxes, lines, alphanumeric characters).

Three types of command sets are used in the Graphics mode:

- standard graphics
- extended graphics
- extended graphics/high resolution.

Figure 1 illustrates the relationship between the Normal and Graphics modes of operation as described above. In addition, at the beginning of each command in this chapter, the graphics mode(s) in which that command operates are listed.

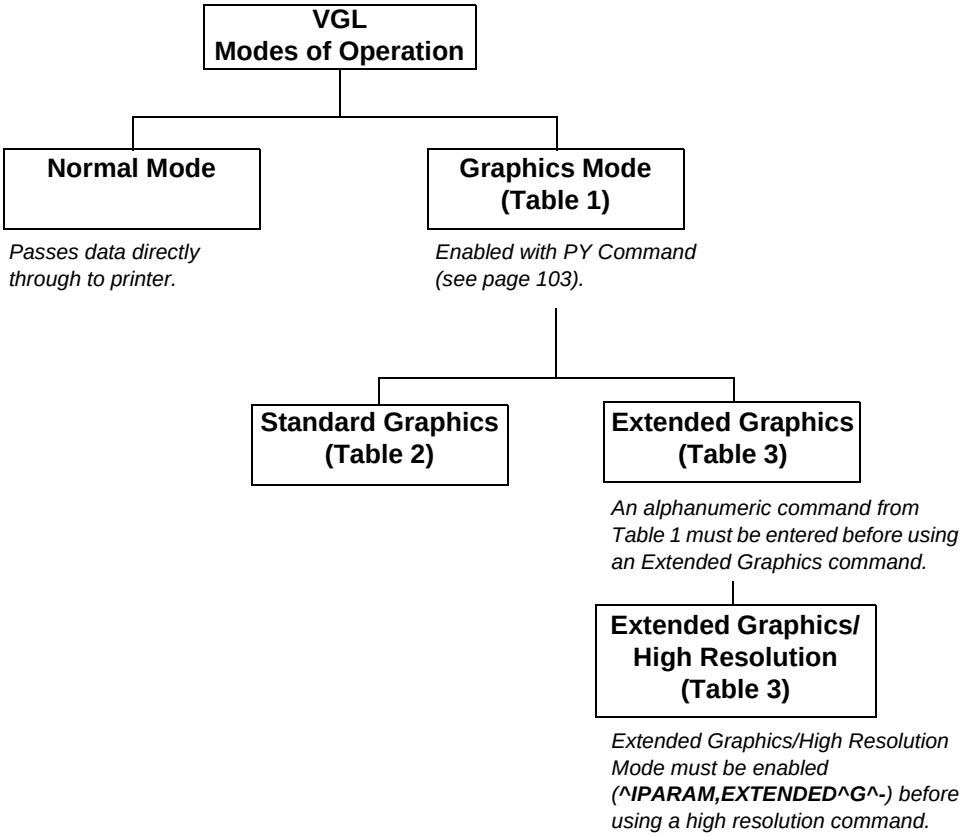


Figure 1. Modes of Operation

VGL Command Standards

Many of the commands described in this chapter include an example to illustrate the application. Commas are used in the example commands to easily identify the various command parameters.

Many of the example commands shown also require the Free Format command. Using the Free Format command in the examples more clearly identifies the data and command parameters.

The commands used to operate VGL have various selectable options and a specific format that you must follow to obtain the desired results. These command standards are described in the following sections. Become familiar with their meaning and use before operating VGL.

Special Function Control Code (SFCC)

The SFCC identifies a command directed to VGL to enable a specific VGL function. Based on the host computer interface or application requirements, you can set the SFCC to any decimal character from 17 through 255 (hex 11 through hex FF).

When VGL is shipped, the caret symbol (hex 5E), "^", is configured as the SFCC. You can change the SFCC as described in your user's manual, or as described in "Special Function Control Code Change" on page 144.

Throughout the practical examples in this manual, the SFCC is shown as a **^** (caret, hex 5E, dec 94); always use the actual SFCC required by your system configuration wherever the ^ is shown.

In the general command formats, the SFCC is represented by (cc). Always substitute the actual SFCC required by your system configuration in the general command format where (cc) is shown. *Do not* enter parentheses with your SFCC.

NOTE: Refer to your *User's Manual* for a description of SFCC selections. Perform a configuration printout and examine the configuration option listing to determine which SFCC is currently selected.

Command Sequence

Individual commands are made up of various command parameters (such as character height or width parameters). Each command generally begins with the SFCC. You can string many commands together to form a command sequence, or command line. After the Graphics Mode is enabled by the Graphics Mode Enable command, you can input a command sequence. The command sequence includes all commands and data from the initial SFCC of the first command to the sequence terminator.

The VGL buffer holds and can process approximately 64K characters in a single graphics command sequence. However, if a single command sequence exceeds the buffer capacity, you can use the Interrupt command (page 106). The Interrupt command breaks the command sequence and specifies where the sequence begins printing again.

Command Parameters

Most commands have a number of variable parameters for which input is required. Throughout this manual, actual commands required for input are shown exactly as they must be entered, while all the *variable* parameters associated with that command are shown in *italics.*

Brackets

Paired brackets [ ] indicate an optional command parameter. You can choose to use or not use such a command parameter, but *do not* enter the brackets in the command sequence.

Spaces

Spaces are used in the general command formats to visually separate individual command parameters. You must supply the information for the command parameter, but *do not enter the spaces* in the command sequence; they are shown simply as a visual aid to illustrate where one command parameter ends and another begins.

Comma

VGL accepts commas as parameter diameters. Commas are often helpful in distinguishing the various numeric parameters within the command sequence. Commas are not allowed immediately after the SFCC or before the first data character. Commas within the command sequence are optional unless they are a part of the command format (i.e., IBARC, IFONT,S, etc.). If used, commas occupy character spaces in the buffer and require processing time. In the practical examples throughout this manual, commas are used in the command sequences.

Terminator

Each command line, or command sequence, *must* be followed by a valid terminator. Valid terminators are as follows: carriage return (CR, hex 0D), line feed (LF, hex 0A), form feed (FF, hex 0C), vertical tab (VT, hex 0B), EVFU commands (hex 10-1F), hex 01 and hex 06, and PI line commands. A complete command sequence is the very first character (including the SFCC) to and including the terminator.

Certain terminators have different functional effects based on their use with standard graphics commands or within extended graphics command sequences. For example, CR, FF, and LF function as sequence terminators within an extended graphics command sequence.

If the Free Format command is used, host generated terminators are ignored and only the standard graphics command terminators are recognized. See Table 2 on page 27 for a list of the Standard Graphics Commands and appropriate page references where additional information is provided.

Character Height, Width, and Intercharacter Spacing

Alphanumeric height and width parameters include the intercharacter spacing as shown in Figure 2. The intercharacter spacing is the space between characters. (Scalable fonts, however, change the size of the intercharacter gap used depending on the characters used.) Intercharacter spacing is measured to the right of standard or upside-down characters and to the bottom of sideways characters.

For example, specifying a character width of .5-inch in normal resolution results in a five-dot column intercharacter spacing to the right or bottom of that character based on orientation. Generally, intercharacter spacing is not accounted for to the left, above, or below characters except when printing reverse images or descending characters.

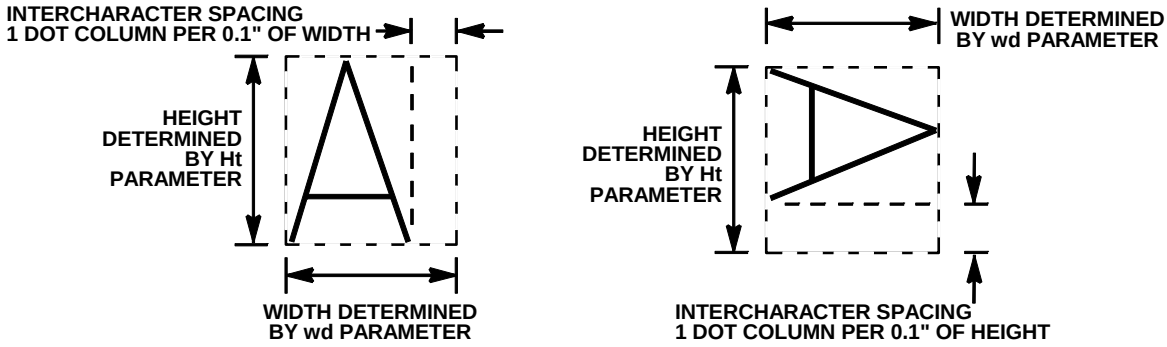


Figure 2. Character Height, Width, and Intercharacter Spacing

Normal Mode

In Normal Mode, data passes directly through VGL to the printer without processing except to check for the SFCC and the Graphics Mode Enable or the Enable Non-Graphics Free Format command. This normal, or *pass-through*, data assumes the standard 10 cpi print mode, and all other standard printer features function normally according to the configuration and programming of the printer.

NOTE: Printers must be configured at the control panel for Data Processing 10 cpi (DP 10) print mode at 6 lpi for VGL to operate properly. To set a line spacing when VGL is active, use the Line Spacing (@**L**) command described on page 110.

Graphics Mode

Some graphics commands have different functions depending on whether the command is used within an extended or a standard graphics command sequence. For example, the **W** command identifies a standard graphics command line slew; when used within an extended graphics command sequence, **W** identifies a Character Width Change command. Therefore, be certain of appropriate command usage to obtain the desired results.

Also, graphic commands have different parameters and different functionality depending on whether the command is used in normal or high resolution graphics mode.

Each command in this chapter is presented in alphabetical order. The tables on the following pages list VGL commands according to the graphics mode in which it operates. Information specific to the Extended Graphics/High Resolution Mode, such as expanded parameter definition, is supplied on the command description page for each command available in the mode.

Data Positioning

In Graphics Mode, you must understand certain positioning rules to obtain the desired results. Horizontal and vertical starting positions of a command are determined either by *implied* relative position to the prior graphics command or *explicit* position from a positioning command.

Implied Relative Positioning

For any graphics command sequence (a string of one or more extended graphics commands), the initial "relative" print position is the current dot row and column 1 or the Graphics margin, if set.

NOTE: Because previous command sequences may have been used to define prior printing on the page, the actual physical position of the print mechanism may be on a different row, but it will be always in column 1 or the Graphics margin, if set.

Without an immediately preceding positioning command, the starting position of any command within the sequence is dot row 1 and the first dot column past the right edge of the previous command "print envelope." This implied position may be modified horizontally or vertically by specific positioning commands.

Without explicit *horizontal* positioning commands, the horizontal print position constantly increases within the command sequence. Each command starts at the right edge of the previous command. Without explicit *vertical* positioning commands, the vertical print position for each command within a sequence is always at relative dot row 1 (the current physical position of the print mechanism resulting from printing the last sequence).

Explicit Positioning Commands

Use the Horizontal Tab command to change the horizontal print position. With the Horizontal Tab command, any horizontal print position on the current print line can be specified as the print position.

NOTE: The control panel form feed key will operate differently depending on the source of form feed control at the time the key is pressed. Form feed is controlled by the LP+ and VGL emulation at different times.

The vertical print position can be changed using the Justification command or justification parameter within one of the alphanumeric commands. The Justification command or parameter specifies a vertical position down the form from the current print position. Additionally, you can use standard graphics commands for line slew, dot slew, line feed, form feed, or EVFU commands to specify a vertical print position.

These positioning commands and their use are described within this chapter. It is important to remember that the end of a command sequence always resets the "origin" for all subsequent positioning to row 1, column 1 or the left Graphics margin.

Vertical Dot Density

A vertical tenth-inch in normal resolution mode equals 7 dots based on 72 dpi vertical dot density. A true vertical tenth-inch at 72 dpi would be 7.2 dots. Since .2 dots is not printable, seven dots are used and the vertical measurement of a line, box, or similar graphic element is not exact.

A vertical inch in high resolution mode equals 292/300 times the printer vertical dot density. A vertical inch at 300 dpi would be 292 dots. Therefore, when specifying the size of your graphic elements, be aware that the vertical dimensions of your graphic design print slightly smaller than the value specified in your command.

You can enable the "True vert 1/10" option which allows the vertical size/position parameter to be in true inches. With this option enabled in normal resolution, vertical dimensions are as close to true as possible based on a 72 dpi dot density (e.g., 1.0 inch is exact at 72 dots. While 1.2 inch is close at 86 dots, exact would be 86.4 dots.) In high resolution, with true vert 1/10, vertical dimensions are exact or nearly exact due to the higher dot density.

Command Codes

The tables on the following pages list each VGL command according to the Graphics Mode in which it operates. Following these tables, each command in this chapter is presented in alphabetical order.

Graphics Mode Enable Commands

To enable the Graphics Mode, you must use the Graphics Mode Enable command. Table 1 summarizes the Graphics Mode Enable and Disable commands and the four alphanumeric commands, which are fully described on the referenced pages. After enabling the Graphics Mode, alphanumeric commands, standard graphics commands, or extended graphics commands are available.

Table 1. Graphics Mode Commands

Command	Description	Page #
IPARAM	Graphics Resolution	29
PF	Free-Format Enable, Non-Graphics	101
PO	Free Format Disable, Non-Graphics	102
F	Free Format (graphics) Enable	99
O	Free Format (graphics) Disable	99
PY	Graphics Mode Enable	103
PN	Graphics Mode Disable	104
M	Alphanumerics, Standard	32
V	Alphanumerics, Rotated Clockwise (Top Down)	32
E	Alphanumerics, Rotated Counterclockwise (Bottom Up)	32
E	Alphanumerics, Rotated Counterclockwise-Reverse String	32
U	Alphanumerics, Inverted	32
U	Alphanumerics, Inverted-Reverse String	32
in	Character Set Selection (Multinational Character Set)	337
I	Interrupt	106
un	User Set Selection (Multinational Character Set)	343
IPAGE	Page, Controlling Paper Options	122

NOTE: Some systems pad the data stream with characters and spaces. If the VGL file on your system contains padded characters or spaces before the SFCC, this padded data must be ignored before VGL can operate. The Ignore Data command (**X**), discussed on page 105, is provided for this purpose.

Similarly, sometimes you may need VGL to ignore host-generated paper movement commands (carriage return, line feed, form feed, etc.) in lengthy data streams. The Free Format command (**F**), discussed on page 99, is designed for this purpose.

Standard Graphics Commands

Standard graphics commands can be used any time VGL is in the Graphics Mode. They set internal control values or are sent directly to the printer for processing. Standard graphics commands are summarized in Table 2 and fully described on the referenced pages.

NOTE: The Graphics Mode (Table 1) must be enabled before issuing a Standard Graphics command.

Table 2. Standard Graphics Commands

Command	Description	Page #
-	Carriage Return	41
@C	Character Type	46
#x	Compressed Print	47
!	Direct Printer Command, Hex 01	53
"	Direct Printer Command, Hex 02	53
#	Direct Printer Command, Hex 03	53
$	Direct Printer Command, Hex 04	53
%	Direct Printer Command, Hex 05	53
&	Direct Printer Command, Hex 06	53
'	Direct Printer Command, Hex 07	53
(	Direct Printer Command, Hex 08	53
.	Direct Printer Command, Hex 0E	53
/	Direct Printer Command, Hex 0F	53
D	Dot Slew	54
S	Duplication, Horizontal	54
IREPH,	Duplication, Horizontal (Version II)	56
R	Duplication, Vertical	57
Y	Auto-Increment/Decrement Vertical Duplication	59

Table 2. Standard Graphics Commands (continued)

Command	Description	Page #
IREPV,	Duplication, Vertical (Version II)	63
B	Dynamic Form	65
[or {	Dynamic Form, Field Length	67
C	Dynamic Form, Copy Fields	69
R	Dynamic Form, Repeat Form	71
>	EVFU, Start Load	73
?	EVFU End Load	73
0-9	EVFU Channels 1 through 10	73
:	EVFU Channel 11	73
;	EVFU Channel 12	73
<	EVFU Channel 13	73
=	EVFU Channel 14	73
@E	Emphasized Print	76
IEMUL,	Emulation Switch	77
,	Form Feed	88
L	Form Length (with PI Line Enabled)	89
H	Form Length	89
ILOAD,	Font Load	77
IFONT,	Font, Selecting Default (Version II)	78
F	Free Format (graphics) Enable	99
O	Free Format (graphics) Disable	99
@H	Hex Dump	104
X	Ignore Data	105
*****	Line Feed	110
K	Line Slew	111
W	Line Slew	111
@L	Line Spacing	111
Q	Plotting Graphics (Rows), (Odd Dot Plot)	132
C	Plotting Graphics (Rows), (Even Dot Plot)	132
@R	Reset	135

Table 2. Standard Graphics Commands (continued)

Command	Description	Page #
N	Special Function Control Code Change	144
T	Tab, Horizontal (Set Graphics Margin)	151
+	Tab, Vertical	155
@U	Underlined Print	156

Extended Graphics Commands

Specific graphics functions (lines, boxes, alphanumerics, forms, barcodes, reverse printing, etc.) are available through commands sent as part of an extended graphics command sequence. Table 3 summarizes the extended graphics commands, which are fully described on the referenced pages.

Extended commands must be used as part of an alphanumeric command sequence (after VGL is in the Graphics Mode). In some cases, the actual command may have a different meaning and perform a different function when used within an extended graphics command sequence compared to its use as a standard graphics command.

NOTE: An alphanumeric command from Table 1 must be used before issuing an Extended Graphics Command.

Table 3. Extended Graphics Commands

Command	Description	Page #
IBARC,	Barcode (Version II)	164
B	Barcode, Horizontal	160
C	Barcode, Vertical	160
LB	Boxes	39
H	Character Height	42
W	Character Width	44
in	Character Set Selection	345
KF	Dark Print	49
D	Descending Characters	51
IREPH,	Duplication, Horizontal (Version II)	56
IREPV,	Duplication, Vertical (Version II)	63
f	Fill (for Standard and Expanded User-Defined Symbols)	148
IFONT,S,	Font, Selecting Default (Version II)	78
Font	Fonts, Rotatable	82

Table 3. Extended Graphics Commands (continued)

Command	Description	Page #
S	Fonts, Compressed Print Density	85
LF	Forms Construction	90
IFORM,C	Forms, Creating Dynamic (Version II)	93
IFORM,D	Forms, Deleting Dynamic (Version II)	94
IFORM,E	Forms, Executing Dynamic (Version II)	94
IFORM,L	Forms, Listing Dynamic (Version II)	95
IFORM,R	Forms, Resetting Dynamic (Version II)	99
J	Justification, Vertical	108
LD	Lines, Dashed	113
LS	Lines, Solid	116
Q	Plotting Graphics (Columns)	129
IHEX,	Passing Hex Value to the Printer	124
ILOGO,	Logo Generation (Version II)	118
IPCX,	Logo, PCX	120
ITIFF,	Logo, TIFF	121
IPEXP,	Pixel Expansion (Version II)	125
IPLOT,	Plotting Bitmap Images	127
R	Reverse Print	136
KH	Shading	140
KL	Shading Mask	142
Z	Symbols, Printing	150
zx	Symbol, Creating Expanded User-Defined	148
zx	Symbol, Creating Standard User-Defined	145
T	Tab, Horizontal	151

Extended Graphics/High Resolution Commands

In Extended Graphics/High Resolution Mode, you can access the extended graphics commands as well as new commands designed to achieve enhanced resolution for thermal printing. This mode allows you to specify graphic elements and characters in expanded size and position parameters. Graphic elements (lines, boxes, and forms) can now be defined in increments of one thousandth of an inch. Characters can now be specified in increments of one hundredth of an inch. As a result of these enhancements, you can print forms and labels that include high resolution text, graphics and barcodes.

The actual positioning and size, however, can be only as "fine" as your printer resolution (dpi). For example, a graphic position change of 0.001, 0.002, or 0.003 would result in one printer dot at 300 dpi (1 - .0033 inches). Also, because the actual height of characters change in increments of seven printer dots (0.0233 inches at 300 dpi), a size specification of 0.01 inch or 0.02 inch would result in a character of the same size.

To enable Extended Graphics/High Resolution Mode, you must have already enabled Graphics Mode through use of the **^PY** command. You cannot enable the Extended Graphics/High Resolution Mode, however, from within a graphics pass (an alphanumeric command, **^M**, **^E**, **^U**, or **^V**).

Once in Graphics Mode, type the following command to enable Extended Graphics/High Resolution Mode:

^IPARAM,EXTENDED^G^-

Once in Extended Graphics/High Resolution Mode, type the following command to return to normal resolution Graphics Mode:

^IPARAM,NORMAL^G^-

VGL initially operates in normal resolution mode. To switch between normal and high resolution, send the appropriate command shown above, or use the "Cmd Resolution" option on the front panel menu.

You can switch between normal and high resolution between graphics passes on the same page. VGL maintains the current resolution setting after a **^PN** ("Exit Graphics Mode") command has been sent.

Example:

^PY^-

^IPARAM,EXTENDED^G^-

^M02002001000 text in high resolution^-

^IPARAM,NORMAL^G^-

^M0202100 text in normal resolution^-

^PN^-

Alphanumerics

Purpose Produces alphanumeric text (i.e., numbers and alphabet letters) in standard, rotated or inverted orientations. A reverse string order option is also available in the rotated and inverted orientations.

Mode Graphics

Format (cc) *x ht wd jus data* [(cc)G] (cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

x Represents an Alphanumeric command. Replace *x* with one of the following alphanumeric orientations*:*
M for Standard Alphanumerics
V for Rotated Clockwise
E for Rotated Counterclockwise
U for Inverted

ht Normal Resolution:
Defines the character height in tenth (.10) inches. Enter a two-digit height value ranging from **01** through **99** to define a character height of 0.1 through 9.9 inches. VGL automatically understands the decimal point between the first and second digits. Height values of 00 and 01 have special meanings for rotatable/high-speed fonts as described in “Fonts, Rotatable” on page 82.

High Resolution:
Defines the character height in hundredth (.01) inches. Enter a three-digit height value ranging from **001** through **999** to define a character height of 0.01 inch through 9.99 inches. VGL automatically understands the decimal point between the first and second digits.

The actual height of the printed character increases in increments of seven printer dots. Changing the *ht* field by one printer dot, therefore, may not produce a change in the actual printed character. You must increase the field by at least seven printer dots in order to produce an actual change in character height.

wd Normal Resolution:
Defines the character width in tenth (.10) inches. Enter a two-digit width value ranging from **01** through **99** to define a character width of 0.1 through 9.9 inches. VGL automatically understands the decimal point between the first and second digits. Width values of 00 and 01 have special meanings for rotatable/high-speed fonts as described in “Fonts, Rotatable” on page 82.

High Resolution:
Defines the character width in hundredth (.01) inches. Enter a three-digit width value ranging from **001** through **999** to define a character width of 0.01 inch through 9.99 inches. VGL automatically understands the decimal point between the first and second digits.

The actual width of the printed character increases in increments of six printer dots (characters per inch). Changing the *wd* field by one printer dot, therefore, may not produce a change in the actual printed character. You must increase the field by at least six printer dots in order to produce an actual change in character width.

NOTE: High Resolution mode does not allow a character height or width parameter of 0. If 0 is used, a 1 is substituted. Fonts, Rotatable (see page 82) cannot be accessed in High Resolution.

NOTE: In vertical alphanumeric commands, height refers to the physical height of the character and intercharacter spacing top to bottom on the page (from the left to right edge of the printed character). Width refers to the physical width of the character from left to right on the page (from the bottom to the top of the printed character).

jus

Normal Resolution:
Defines vertical justification (position) for character printing in tenth inches and dot rows. Enter a three-digit value ranging from **000** through **999** to define the printing location down from the starting position of the command sequence. The first two digits specify 0.1 through 9.9 inches downward justification; the third digit specifies an additional 0 through 9 dot rows of downward justification. VGL automatically understands the decimal point between the first two digits and the third digit is automatically interpreted as dot rows.

High Resolution:
Defines vertical justification (position) for character printing in thousandth inches. Enter a five-digit value ranging from **00000** through **99999** to define the printing location down from the starting position of the command sequence from 0.0 inch through 99.999 inches. VGL automatically understands the decimal point between the second and third digits as thousandths.

If the data character immediately following the *jus* field is not a digit (zero through nine), then you can omit trailing zeros. For example, the command **^M10010001ABC**, results in a 1.000 inch justification because the three empty spaces in the *jus* field (before the characters “ABC”) are completed with three implied trailing zero digits. (See “Justification, Vertical” on page 108.)

NOTE: If your data to be printed begin with a number (not a character), then you must complete the field; otherwise, VGL assumes the number is a digit in the field value.

As in normal resolution mode, the *ht* field of either an alphanumeric command or a height/width command also specifies the height of any succeeding barcode in the graphics pass. The field value is not specified in increments of six or seven printer dots, however. In normal resolution mode, you can select character sizes 10 characters per inch (cpi), 12 cpi, 15 cpi and size 0 by height and width parameters in 0 and 1 digit combinations. You cannot perform this type of character size selection, however, in Extended Graphics/High Resolution Mode.

data	The data characters to print or a specific graphics command (such as one of the barcode commands, a horizontal tab command, etc.).
(cc)G	(Optional) Reverses the character data from the actual input order. This parameter is available only with the Rotated Counterclockwise command (E) or the Inverted Rotated Alphanumeric command (U). Enter the SFCC for your VGL configuration immediately followed by **G.**
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The Graphics Mode (PY) must be enabled before sending an alphanumeric command. Alphanumeric commands must be a part of the command sequence before using specific graphics commands. Alphanumeric commands must be used to initiate any extended graphic command sequence. Other data or graphic commands can be used with alphanumeric commands.

Examples Normal resolution examples for each of the four alphanumeric orientations follow. Rotated Clockwise alphanumerics print characters with a clockwise vertical rotation; the characters are read top to bottom. Rotated Counterclockwise alphanumerics print characters with a counterclockwise vertical rotation; the characters are read bottom to top. Inverted alphanumerics print characters upside down; the characters are read right to left. Rotated Counterclockwise and Inverted Rotated alphanumerics have an optional reverse string parameter option.

NOTE: When the alphanumeric command is used simply to introduce one of the extended graphics commands (such as Horizontal Tabs, Justification, Dark Print, etc.), the alphanumeric command parameters are optional and can be entered only as needed. However, the alphanumeric command parameters are required for Barcode commands.

Alphanumerics Examples

The following sample commands in this section illustrate some applications for standard, rotated and inverted alphanumeric features in normal resolution mode. (Note that the Free Format enable and disable commands, ^F and ^O, are used.)

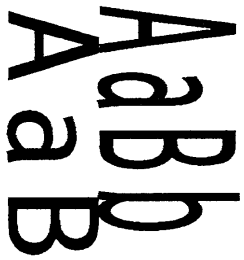
Standard Alphanumerics:

```
^PY^-^F^-
^M06,04,000AaBb^M04,06,000AaBb^-
^O^-^PN^-
```

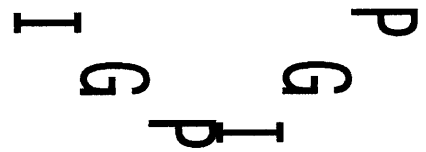
```
^PY^-^F^-
^M03,03,000I^M03,03,030G^M03,03,060P
^M03,03,060I^M03,03,030G^M03,03,000P^-
^O^-^PN^-
```

Rotated Clockwise Alphanumerics:

```
^PY^-^F^-
^V06,04,000AaBb^V04,06,000AaBb^-
^O^-^PN^-
```

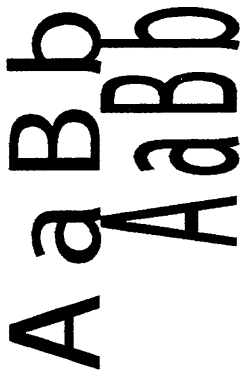


```
^PY^-^F^-
^V03,03,000I^V03,03,030G^V03,03,060P
^V03,03,060I^V03,03,030G^V03,03,000P^-
^O^-^PN^-
```



Rotated Counterclockwise Alphanumerics:

```
^PY^-^F^-
^E06,04,000AaBb^E04,06,000AaBb^-
^O^-^PN^-
```

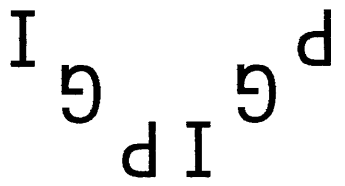


```
^PY^-^F^-
^E03,03,000I^E03,03,030G^E03,03,060P
^E03,03,060I^E03,03,030G^E03,03,000P^-
^O^-^PN^-
```

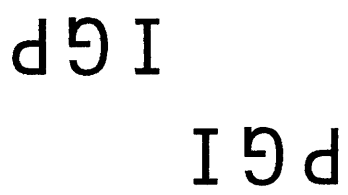
Inverted Alphanumerics:

```
^PY^-^F^-
^U06,04,000AaBb^U04,06,000AaBb^-
^O^-^PN^-
```

```
^PY^-^F^-
^U03,03,000I^U03,03,030G^U03,03,060P
^U03,03,060I^U03,03,030G^U03,03,000P^-
^O^-^PN^-
```

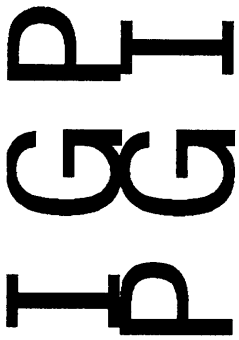


```
^PY^-^F^-
^U03,03,000IGP^U03,03,060PGI^-
^O^-^PN^-
```



Alphanumerics Reverse String:

```
^PY^-^F^-
^E08,05,000IGP^E08,05,000IGP^G^-
^O^-^PN^-
```



```
^PY^-^F^-
^M020,020,01000^T01.500HIGH RESOLUTION SMALL PRINT
^I01.500^-
^M006.008.00000^T01.500SIX BY EIGHT
^M010.010.00000^T03.500TEN BY TEN
^M012.010.00000^T05.500TWELVE BY TEN
^-
^O^-^PN^-
```

HIGH RESOLUTION SMALL PRINT

SIX BY EIGHT TEN BY TEN TWELVE BY TEN

```
^PY^-^F^-
^M020.020.00000^T01.200HIGH RESOLUTION REVERSE STRING
^I00.500^-
^U055.030.00000^T01.000^D              upside down^D^-
^U055.030.00000^T01.000^Dupside down reversed^G^D^-
^O^-^PN^-
```

HIGH RESOLUTION REVERSE STRING

uʍop ǝpᴉsdn
ndsᴉpǝ pomu ɹǝʌǝɹsǝp

Boxes

Purpose Produces a rectangular box.

Mode Graphics with an Extended Graphics Command selected

Format (cc) LB *horz vert h v* (cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

LB The Box command. Enter **LB**.

horz Normal Resolution:
Defines the horizontal length of the box in tenth inches and dot columns. Enter a three-digit horizontal length value ranging from **000** through **999** to define a horizontal length of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot columns of length. VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot columns. For example, entering 0126 specifies a 1.2-inch plus 6-dot column horizontal length; entering 1016 specifies a 10.1-inch plus 6-dot column horizontal length.

High Resolution:
Defines the horizontal length of the box in thousandth inches. Enter a five-digit horizontal value ranging from **00000** through **99999** to define a horizontal length of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits. The *horz* field must be at least twice the value of the thickness of the vertical sides (*v*).

vert Normal Resolution:
Defines the vertical length of the box in tenth inches and dot rows. Enter a three-digit vertical length value ranging from **000** through **999** to define a vertical length of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot rows of length. VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot rows. For example, entering 0204 specifies a 2.0-inch plus 4-dot row vertical length; entering 0242 specifies a 2.4-inch and 2-dot row vertical length.

High Resolution:
Defines the vertical length of the box in thousandth inches. Enter a five-digit vertical value ranging from **00000** through **99999** to define a vertical length of 0.001 through 99.999 inches. VGL automatically understands the decimal between the second and third digits. The *vert* field must be at least twice the value of the thickness of the horizontal sides (*h*).

h

Normal Resolution:
Defines the horizontal border thickness in dot columns. Enter a number ranging from **1** through **9** to specify a horizontal border thickness from 1 through 9 dots.

High Resolution:
Defines the horizontal border thickness in thousandth inches. Enter a three-digit value ranging from 000 through 999 to define a horizontal border thickness from 0.000 through 0.999 inches.

v

Normal Resolution:
Defines the vertical border thickness in dot rows. Enter a number ranging from **1** through **9** to specify a vertical border thickness from 1 through 9 dots.

High Resolution:
Defines the vertical border thickness in thousandth inches. Enter a three-digit value ranging from 000 through 999 to define a horizontal border thickness from 0.000 through 0.999 inches.

(cc)-

Graphics Mode CR used as a sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

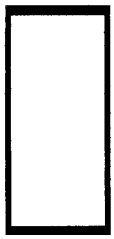
Comments

Box drawing uses horizontal and vertical length parameters. Boxes are positioned on the page using an alphanumerics command sequence (such as horizontal tabs, the justification parameter, etc.). Consequently, an alphanumeric command must precede a Box command. The horizontal and vertical border thickness can also be specified in varying line thicknesses.

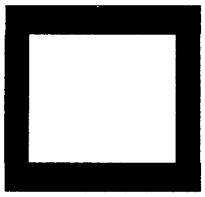
Examples The following commands illustrate boxes in normal resolution. As shown in the examples, changing the horizontal and vertical length and border thickness parameter values construct a variety of boxes. (The Graphics Mode Enable command and an alphanumerics command were previously sent.)

```
^LB0425,0150,5,2^-
```

```
^LB0052,0123,3,2^-
```



```
^LB0100,0100,9,9^-
```



Carriage Return

Purpose Terminates a command.

Mode Graphics with a Standard Graphic Command selected

Format (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
-	The graphics CR mnemonic. Enter **-**.

Comments

The VGL Graphics Mode carriage return (CR) performs the same function as a standard carriage return (hex 0D) when used to terminate a standard graphics command. When used to terminate a graphics sequence in an extended graphics command when Free Format is enabled, this command functions as a sequence terminator.

Character Height

Purpose Specifies a new alphanumeric height.

Mode Graphics with an Extended Graphics Command selected

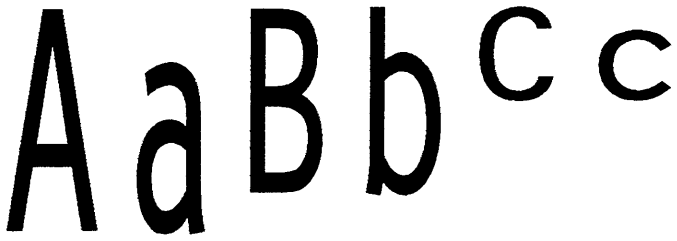
Format (cc) H *ht data* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
H	The Character Height command. Enter **H**.
ht	Normal Resolution: Defines the new character height in tenth inches. Enter a two-digit height value ranging from **01** through **99** to define a character height of 0.1 through 9.9 inches. The decimal point between the digits is automatically understood by VGL. High Resolution: Defines the new character height in hundredth inches. Enter a three-digit height value ranging from **001** through **999** to define a character height of 0.01 inch through 9.99 inches. VGL automatically understands the decimal point between the first and second digits. The actual height of the printed character increases in increments of seven printer dots. Changing the *ht* field by one printer dot, therefore, may not produce a change in the actual printed character. You must increase the field by at least seven printer dots in order to produce an actual change in character height. The printable data for the new height is input following the new height parameter.
data	Identifies the characters to print at the new height.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

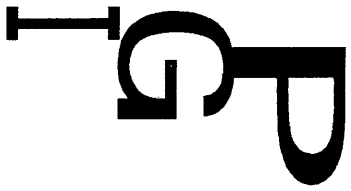
Comments The H command specifies a new alphanumerics height parameter without sending the complete alphanumerics command sequence again. Only the character height is affected by this command; character width, justification, rotation, or any other parameter specifications remain unchanged. The Character Height command is input as part of the data in one of the alphanumeric commands.

Examples The following sample commands illustrate character height changes in normal resolution. (The Graphics Mode Enable command was previously sent to enable Graphics Mode but is not shown in the examples.)

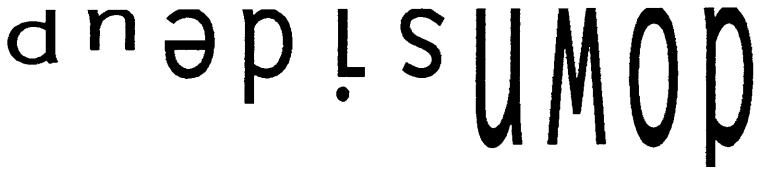
```
^M12,06,000Aa^H10Bb^H05Cc^-
```




```
^V05,05,000I^H10G^H15P^-
```



```
^U03,04,000up^H05side^H10down^-
```



Character Width

Purpose Specifies a new alphanumeric width.

Mode Graphics with an Extended Graphics Command selected

Format (cc) W *wd data* (cc)-

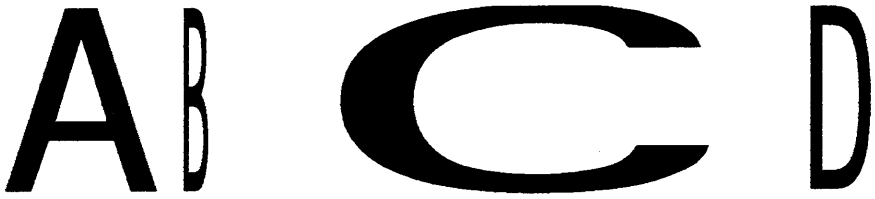
(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
W	The Character Width command. Enter **W.**
wd	Normal Resolution: Defines the new character width in tenth inches. Enter a two-digit width value ranging from **01** through **99** to define a character width of 0.1 through 9.9 inches. VGL automatically understands the decimal point between the digits. High Resolution: Defines the new character width in hundredth inches. Enter a three-digit width value ranging from **001** through **999** to define a character width of 0.01 inch to 9.99 inches. VGL automatically understands the decimal point between the first and second digits. The actual width of the printed character increases in increments of six printer dots (characters per inch). Changing the *wd* field by one printer dot, therefore, may not produce a change in the actual printed character. You must increase the field by at least six printer dots in order to produce an actual change in character width. The printable data for the new width is input following the new width parameter.
data	Identifies the characters to print at the new width.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The **W** command specifies a new alphanumerics width parameter without sending the complete alphanumerics command sequence again. Only the character width is affected by this command; character height, justification, rotation, or any other parameter specifications remain unchanged. The **W** command is input as part of the data in one of the alphanumeric commands.

Examples The following sample commands illustrate character width changes in normal resolution.

```
^PY^-
^M10,10,000A^W02B^W30C^W05D^-
^PN^-
```



```
^PY^-
^V05,05,000I^W10G^W15P^-
^PN^-
```

NOTE: The command sequence below also uses the Horizontal Tab (T012,5 and T017,5) command for character spacing.

```
^PY^-
^E10,10,000I^T012,5^W02G^T017,5^W25P^-
^PN^-
```

```
^PY^-
^U05,05,000DOWN^W01SIDE^W10UP^-
^PN^-
```

Character Type

Purpose Selects a character type or character per inch (cpi) density.

Mode Graphics with a Standard Graphic Command selected

Format (cc) @ C *type* (cc)* *data* (cc)*

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
@	Specifies one of the @ commands. Enter @ to begin an @ command function.
C	Specifies the Character Type command. Enter **C**.
type (cc)*	Represents the type parameter. Enter one of the 2-digit codes shown in Table 4 to select a character type, followed by the SFCC. For example, enter **^@C17^*** to select 17.65 cpi. This cpi remains effective until a new @**C** command is sent.
data	The data to be printed in a selected font.
(cc)*	Graphics Mode LF. Enter the SFCC for your VGL configuration immediately followed by ***** to end the command sequence.

Comments

The @**C** command can be used anytime VGL is in the Graphics Mode. Once a new character type is selected, all standard Graphics mode text lines are printed in the selected type until another type is selected or VGL returns to the Normal Mode. If another type is selected, it must be introduced on a separate line from the currently selected character type.

Table 4. Character Type Codes

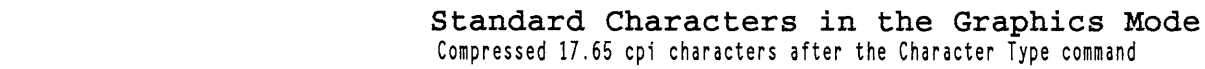
Character Type Code	Character Type Selected
05	Double High (.2”)
0A	OCR-A
0B	OCR-B
10	Standard 10 cpi
12	12 cpi
13	13.33
15	15 cpi
17	17.65
20	20.0 cpi
24	24.0 cpi

NOTE: Due to different printing technologies and dot sizes, some printers may not be capable of printing small characters clearly.

Example The following example illustrates changing character type from the standard characters to 17.65 cpi characters.

```
^PY^-
Standard Characters in the Graphics Mode
^@C17^*Compressed 17.65 cpi characters after the Character Type
command^*
^@C10^-
^PN^-
```

NOTE: The second character type is sent to return VGL to standard 10 cpi print.



Compressed Print

Purpose Selects a compressed print font.

Mode Graphics with a Standard Graphic Command selected

Format (cc) #*x* (cc)- *data* (cc)*
(cc) #0 (cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

#*x* Specifies the compressed print font to use. The values for *x* and the corresponding compression are shown in Table 5.

Table 5. Compressed Print Fonts

Selection Code (*x*)	Compressed Print Font Characters per Inch (cpi)
0	Terminate compressed print
1	10 cpi
2	12 cpi
3	13.33 cpi
4	15 cpi
5	17.65 cpi
6	OCR-A
7	OCR-B
8	12 cpi
9	15 cpi

(cc)-	Graphics Mode CR used as a sequence terminator representing an end to the initial command sequence. Enter the SFCC for your VGL configuration immediately followed by **-** to end the initial sequence.
data	The data for compressed print. All characters are printed in the specified compressed print font until the compressed print command is terminated (0).
(cc)*	Graphics Mode LF used as a sequence terminator representing an end to the data sequence. Enter the SFCC for your VGL configuration immediately followed by ***** to end the data sequence.
(cc)#0	The command to terminate compressed printing. On a separate line, enter the SFCC for your VGL configuration immediately followed by **#0** to terminate use of the compressed print font.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The Compressed Print command can be used anytime VGL is in the Graphics Mode to select one of the compressed print fonts.

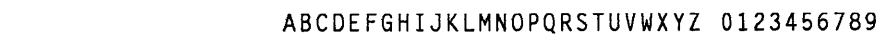
The Compressed Print Off command must be on a separate line from a Compressed Print On command.

Do not place compressed print and alphanumeric commands from the Extended Graphics command set on the same print line.

All pass-through text data input after the Compressed Print On command and before the Compressed Print Off command prints in the selected compressed print font.

Examples **#1: 12 cpi Compressed Print Font.** The following command generates the uppercase alphabet with numbers 0-9 in the 12 cpi compressed print font.

```
^PY^-
^#2^-BCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^*
^#0^-
^PN^-
```



#2: 13.33 cpi Compressed Print Font. The following command generates the uppercase alphabet with numbers 0-9 in the 13.33 cpi compressed print font.

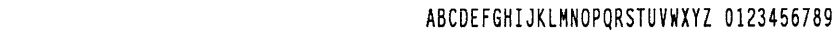
```
^PY^-
^#3^-ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^*
^#0^-
^PN^-
```

#3: 15 cpi Compressed Print Font. The following command generates the uppercase alphabet with numbers 0-9 in the 15 cpi compressed print font.

```
^PY^-
^#4^-ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^*
^#0^-
^PN^-
```

#4: 17.65 cpi Compressed Print Font. The following command generates the uppercase alphabet with numbers 0-9 in the 17.65 cpi compressed print font.

```
^PY^-
^#5^-ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^*
^#0^-
^PN^-
```



Dark Print

Purpose Activates the dark printing feature on line matrix printers to produce darker images.

Mode Graphics with an Extended Graphics Command selected

Format (cc) KF *data* (cc) KF (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
KF	The Dark Print command. Enter **KF** to turn on the dark printing feature.
data	Represents the data characters for dark printing.
(cc) KF	Following the data, enter the Special Function Control Code (SFCC) for your VGL configuration and **KF** to turn off the dark printing feature.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

NOTE: Dark printing has no effect on thermal and laser L7032 printers and is included for compatibility with line matrix printers.

Dark Print command prints all dot positions at half-dot resolution to produce images with a darker intensity. The **KF** command provides special attention when used with barcodes to provide darker barcodes, yet not change the critical bar-width dimensions. Human readable data, however, will print in non-dark mode. Dark print is discussed further in the Chapter 3, on page 159.

The **KF** command operates as a toggle. The first **KF** command enables dark printing, the second **KF** disables dark printing, the third **KF** enables dark printing, and so on.

All data following the first **KF** command will print dark until the second **KF** command is encountered.

The **KF** command is a part of the data contained in an alphanumeric command. When the alphanumeric command sequence is terminated, dark printing is also disabled.

Reverse printing and shading or mask shading can be combined with dark printing to produce a variety of different shades.

Example The following sample commands illustrate dark printing. Combining shading and dark print is also shown.

```
^PY^-
^M03,03,000IGP^KFIGP^KHIGP^KH^KF^-
^PN^-
```

```
^PY^-
^V05,05,000IGP^KFIGP^KHIGP^KF^KH^-
^PN^-
```

Descending Characters

Purpose Prints descending lowercase characters one of two ways: 1) by extending below the print baseline, or 2) by raising the characters slightly to completely contain the descending characters above the print baseline.

Mode Graphics with an Extended Graphics Command selected

Format (cc) D *data* (cc)D (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
D	The Descending Character command. Enter **D**.
data	The data characters for descending character printing. Only lowercase descending characters are printed extending below the print baseline.
(cc)D	Following the data, enter the Special Function Control Code (SFCC) for your VGL configuration and **D** to turn off descending character printing.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

Descending characters are the lowercase characters g, j, p, q, and y and are the only characters affected by this command. Normal descending characters extend below the baseline of normal print. Unless specified, VGL begins each alphanumerics command sequence with descending character print turned off, which means the characters are printed completely above the print baseline.

The **D** command operates as a toggle. The first **D** command enables descending characters to print below the baseline, the second **D** command disables this feature, the third **D** command enables, and so on. All lowercase descending character data following the first **D** command prints below the print baseline until the next **D** command is encountered.

The **D** command is input as part of the data in one of the alphanumeric commands. When the alphanumerics command sequence is terminated, descending character printing is also terminated.

When the **D** command is turned on, VGL automatically allows space for the descending characters whether or not descending characters are part of the data. The amount of space allowed is two dot rows per tenth inch of character height. This space produces a gap under the standard print baseline of non-descending characters. This space also produces a larger reverse print character image background area.

NOTE: The default setting for the **D** command is OFF.
The default setting for the IFONT command, however, is ON.

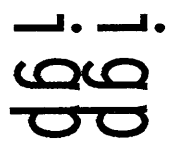
If the **D** command is used after an IFONT command and before the command terminator, the **D** command will always be ON. The IFONT command always overrides a **D** command.

Example The following sample commands illustrate descending character printing. In the first example, notice that the alphanumerics command sequence terminator was also used to end descending character printing. In the second example, notice that when using the rotate clockwise (^V) command with descending characters, and dots are positioned in the *first* dot column, a .10-inch tab was required to prevent out-of-bounds descending characters.

```
^PY^-
^M02,02,000IGP or igp^D and IGP or igp^-
^PN^-
```

IGP or igp and IGP or igp

```
^PY^-
^V03,03,000^T0010igp^Digp^D^-
^PN^-
```



Direct Printer Commands

Purpose Sends control characters for special purposes directly to the Line Printer Plus emulation.

Mode Graphics with a Standard Graphic Command selected

Format See Table 6.

NOTE: The commands in Table 6 are not supported on L7032 printers.

Table 6. Direct Printer Commands

Direct Command	Hex Code Sent to the Printer
^ !	01
^ ”	02
^ #	03 (see note below)
^ $	04
^ %	05
^ &	06
^ ’	07
^ (	08
^ .	0E
^ /	0F

NOTE: Do not use the ^# direct printer command to send hex 03 to the printer at the start of a line. This is to avoid confusion with the Compressed Print command described on page 47.

Comments

A detailed understanding of Line Printer Plus function and response to the control characters is recommended. Refer to the *Line Printer Plus Programmer's Reference Manual* for information regarding the hex codes for various printer commands.

The Graphics Mode must be entered before sending the direct printer commands. However, do not use these commands within an extended graphics command sequence.

Example The following example command sequence sends hex 05 to the printer, initiating the printer plot command to plot the data.

```
^PY^-
^% data ^-
```

Dot Slew

Purpose Changes the vertical print position by specifying a number of dot rows to advance the paper from the current print position.

Mode Graphics with a Standard Graphic Command selected

Format (cc) D *n* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
D	The Dot Slew command. Enter **D**.
n	Specifies the number of dot rows to advance (slew) the paper from the current print position. Enter a two-digit number of dot rows ranging from **01** through **99**. For example, enter 05 to slew 5 dot rows, 21 to slew 21 dot rows.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The (cc)D*n* Dot Slew command dot values are interpreted as 60 dpi P-Series dots.

Duplication, Horizontal

Purpose Activates horizontal duplication.

Mode Graphics with a Standard Graphics Command selected

Format (cc) S # *spacing* (cc)- *data* (cc)S (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
S	The Horizontal Duplication command. Enter **S** to turn on the horizontal duplication feature.
#	Specifies the number of horizontal duplications to print. Enter a two-digit number ranging from **00** through **99** to specify the number of copies.
spacing	Represents the amount of spacing, in tenth inches, between each duplication. The spacing amount should include a sufficient space to contain the complete printed result of the duplicated command sequence plus space for a margin between copies. The right edge of the last duplication must not exceed selected page width. Enter a two-digit number ranging from **00** through **99** to specify a 0.0 through 9.9 inch spacing for the copies.

(cc)-	Graphics Mode CR used as a sequence terminator representing an end to the data. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.
data	Represents the data to be repeated. Enter any valid VGL Graphics Mode command. Specific command sequences are input as part of the Horizontal Duplication data. These commands are then repeated as specified in the Horizontal Duplication command.
(cc)S (cc)-	Mandatory Horizontal Duplication command sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **S**, another SFCC, and **-** to end terminate the Horizontal Duplication command sequence.

Comments

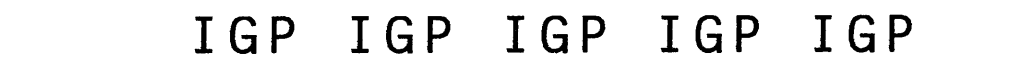
The **S** command operates as a toggle. The first **S** command enables horizontal duplication, the second **S** command disables horizontal duplication, the third **S** command enables duplication, and so on.

All data following the first **S** command repeats the number of times specified until the second **S** command is encountered.

Copies are produced across the page as many times as requested or until the page width is reached. Any duplications that would print beyond column 132 are lost and cause an Element Off Page error (Error 48).

Example The following sample command illustrates horizontal duplication. This extended graphics command sequence consists of a Standard Alphanumeric command using the letters "IGP" printed at a height of 0.2". "IGP" is being duplicated 5 times with a gap of 0.8" between each duplication (0.6" space plus a 0.2" margin between each duplication).

```
^PY^-
^S05,08^-^M02,02,000IGP^-^S^-
^PN^-
```



Duplication, Horizontal (Version II)

This command performs the same function as (cc)S described on page 54. The IREPH command can also operate within an Extended Graphics command. You must enable the Free Format command for this command to work properly.

Purpose Defines both the number of times data is horizontally duplicated (repeated), and the horizontal spacing between each duplication.

Mode Graphics with a Standard Graphics Command selected or Graphics with an Extended Graphics Command selected

Format (cc) IREPH, *n*, *spacing* (cc)G *data* (cc)IREPE

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IREPH, The horizontal duplication command. Enter **IREPH,**.

n, Represents the number of times to duplicate the data horizontally. Enter a value which allows the characters to print within the horizontal page boundaries. Enter a value ranging from **1** through **99**.

spacing Represents the amount of horizontal spacing between the start of each set of repeated data. Enter up to three numbers.

The first and second digits represent horizontal tenths, and the third digit represents horizontal dots. If less than three digits are entered, zeros are automatically inserted from left to right.
Example:
001
012
123

(cc)G The universal terminator. Enter the SFCC for your VGL configuration immediately followed by **G** to terminate the IREPH command.

data Represents the data to be repeated. Enter any valid VGL Graphics Mode command. Specific command sequences are input as part of the Horizontal Duplication data. These commands are then repeated as specified in the Horizontal Duplication command.

One Horizontal Duplication command can be contained within a Horizontal Duplication command. The total number of characters within the command sequence (including all repetitions) must be 256 characters less than the maximum size of the input buffer.

(cc)IREPE The horizontal duplication end command. Enter the SFCC for your VGL configuration immediately followed by **IREPE** to end the horizontal duplication command.

Comments

Multiple IREPH/IREPE duplication loops can be used in a form and can also be nested. Vertical duplication loops (IREPV/IREPE) can also be used in conjunction with IREPH. Each IREPH must have a corresponding IREPE.

Example The following command repeats "IGP" 3 times horizontally using the IREPH, command, separating each set of "IGP" with 5 tenths plus 2 dots of horizontal spacing.

```
^PY^-^F^-
^IREPH,3,52^G^M02,02,000IGP^-^IREPE
^O^-^PN^-
```

IGPIGPIGP

Duplication, Vertical

Purpose Prints multiple copies of data vertically down the page.

Mode Graphics with a Standard Graphics Command selected

Format (cc) R # (cc)- *data* (cc)Z(cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

R Specifies the Vertical Duplication command. Enter **R** to activate vertical repetition.

Specifies the number of times to repeat the data, that is, specifies the number of copies to print. Enter a four digit number ranging from **0000** through **9999** to specify the number of copies.

(cc)- Mandatory Graphics Mode CR terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end terminate the initial Vertical Duplication command sequence.

data Represents the data to be repeated. Enter any valid VGL Graphics Mode command. Specific command sequences are input as part of the Vertical Duplication data. These commands are then repeated as specified in the Vertical Duplication command.

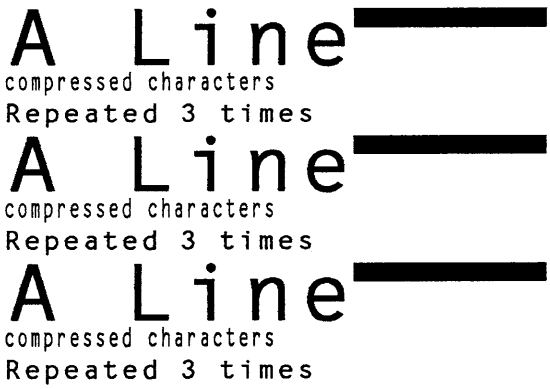
One Vertical Duplication command can be contained within a Vertical Duplication command. The total number of characters within the command sequence (including all repetitions) must be 256 characters less than the maximum size of the input buffer.

(cc)Z(cc)- Mandatory Vertical Duplication command sequence terminator. Enter the SFCC for your VGL configuration immediately followed by Z, another SFCC, and **-** to end terminate the Vertical Duplication command sequence. If a Vertical Duplication command is nested within a Vertical Duplication command, this single terminator sequence terminates both Vertical Duplication commands.

If Auto Increment/Decrement command parameters are used with this command (page 59), this terminator causes all the numeric fields to increase/decrease (as specified by the Auto Increment/Decrement command) at the end of the repeat pass. If the **(cc)ZO(cc)-** (alpha O) terminator is used, all numeric fields are updated sequentially within the repeat pass. See “Auto Increment/Decrement Vertical Duplication” on page 59 for more information.

Example The following example illustrates the Vertical Duplication command. Alphanumeric commands, line elements, and standard graphics commands are repeated 3 times down the page. (The ^*^* causes the two line feeds on which the data is repeated. See the Free Format commands discussed on pages 99 and 102.)

```
^PY^-^F^-
^R0003^-^M03,03,000A Line^LS0100,0010^-
^M^D^S4compressed characters^-
^M^D^S1Repeated 3 times^*^*^Z^-
^O^-^PN^-
```



Auto Increment/Decrement Vertical Duplication

Purpose Updates increment and decrement data within a Vertical Duplication command sequence (page 57).

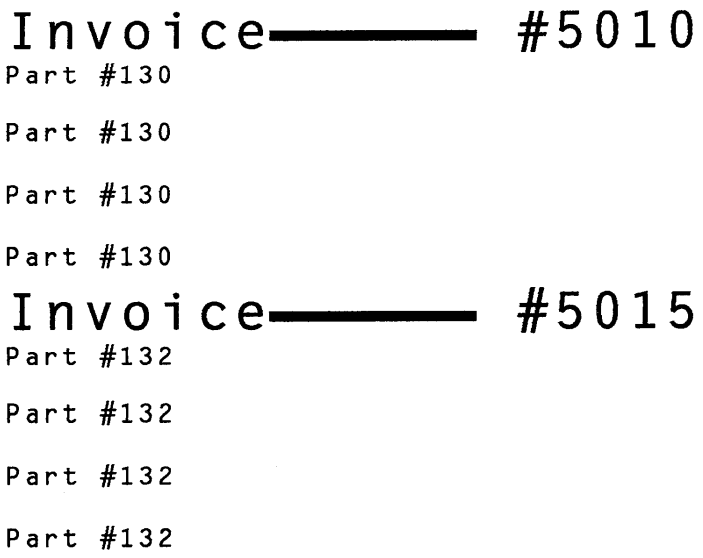
Format (cc) Y *start#* +/- *amount* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
Y	Specifies the Auto Increment/Decrement command. Enter **Y** to activate automatic update of repeated numeric data fields.
start#	Represents the starting numeric data to automatically update. Enter the starting number of the numeric data field ranging from **1** through **12** digits. This number is the first numeric data printed and subsequently updated according to the +/- and *amount* parameters. Spaces are converted to zeros when necessary.
+/-	Specifies increment or decrement updates to the numeric data. Enter **+** to increment the data or enter **-** to decrement the data.
amount	Represents the numeric amount to update the data field. Enter the update amount ranging from **1** through **12** digits. Spaces are converted to zeros when necessary.
(cc)G	The universal terminator. Enter the SFCC for your VGL configuration immediately followed by G to terminate the auto increment/decrement command.

The terminator used in the Vertical Duplication command determines when each inner auto increment field of a nested repeat sequence is updated (incremented/decremented). If the **(cc)Z(cc)-** Vertical Duplication command terminator is used, each inner field is updated at the end of the repeat pass. For example, four fields within a repeat pass would all be updated together at the end of each repeat pass. If, however, the **(cc)ZO(cc)-** Vertical Duplication command terminator is used in the same example, each of the four inner fields is updated sequentially within the overall repeat pass.

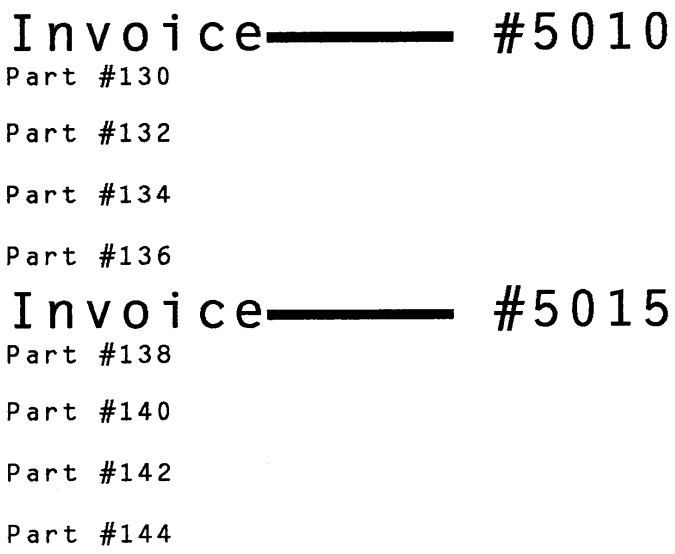
Example 1 The following example illustrates the Vertical Duplication command with Auto Increment/Decrement of numeric fields updated at the end of the repeat pass. (The ^* on the fourth line causes a line feed on which the second set of Invoice data is printed. See the Free Format commands discussed on pages 99 and 102.)

```
^PY^-^F^-
^R0002^-^M02,02,000Invoice
^J010^LS0106,0004^J000 #^Y5010+5^G^-
^R0004^-^M01,01,010Part #^Y130+2^G^-^*^Z^-
^O^-^PN^-
```



Example 2 The following example illustrates the same Vertical Duplication command but uses the different terminator for Auto Increment/ Decrement of numeric fields updated sequentially within the repeat pass. (The ^* on the fourth line causes a line feed on which the second set of Invoice data is printed. Refer to the Free Format commands discussed on pages 99 and 102.)

```
^PY^-^F^-
^R0002^-^M02,02,000Invoice
^J010^LS0100,0004^J000 #^Y5010+5^G^-
^R0004^-^M01,01,010Part #^Y130+2^G^-^*^ZO^-
^O^-^PN^-
```



(cc)Y can be used in conjunction with IREPV and IREPH to achieve auto increment/decrement on both vertical duplication and horizontal duplication for the data, including numeric, alphabetical and barcode data. (cc)Y can also work with (cc)R vertical duplication command (page 57), but NOT with (cc)S horizontal duplication command (page 54). If the data is non-alphanumeric (except for space characters) and you are using the (cc)Y command with the (cc)R Vertical Duplication command, an error occurs. If the data exceeds 12 digits in length, an error also occurs.

Example The following example illustrates the vertical/horizontal duplication commands using IREPV/IREPH.

```
^PY^-^F^-
^IREPV,2,0050^G
^IREPH,3,200^G
^M0202010^YABCD+1^G^-
^M0202010^Y0001-2^G^-
^M0202010^Y000A1+3^G^-
^M0505010^IBARC,C39,E,^YCAV+1^G^-
^IREPE^-
^IREPE^-
^O^-^PN^-
```

Duplication, Vertical (Version II)

This command performs an enhanced function of the (cc)R command described on page 57. The IREPV command can also operate within an Extended Graphics command, and vertical spacing between each duplication can be specified. You must enable the Free Format command for this command to work properly.

Purpose Defines both the number of times data is vertically duplicated (repeated), and the vertical spacing between each duplication.

Mode Graphics with an Extended Graphics Command selected

Format (cc) IREPV, *n*, *spacing* (cc)G *data* (cc)IREPE

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IREPV, The vertical duplication command. Enter **IREPV,**.

n, Represents the number of times to duplicate the data vertically. Enter a value ranging from **1** through **9999**.

spacing Represents the amount of vertical spacing to separate each set of repeated data. Enter up to four numbers.

The first, second and third digits represent vertical tenths, and the fourth digit represents vertical dots. If less than four digits are entered, zeros are automatically inserted from left to right.
Example:
0001
0012
0123
1234

(cc)G The universal terminator. Enter the SFCC for your VGL configuration immediately followed by **G** to terminate the IREPV command.

data Represents the data to be repeated. Enter any valid VGL Graphics Mode command. Specific command sequences are input as part of the Vertical Duplication data. These commands are then repeated as specified in the Vertical Duplication command.

One Vertical Duplication command can be contained within a Vertical Duplication command. The total number of characters within the command sequence (including all repetitions) must be 256 characters less than the maximum size of the input buffer.

(cc)IREPE The vertical duplication end command. Enter the SFCC for your VGL configuration immediately followed by **IREPE** to end the vertical duplication command.

Comments

Multiple IREPV/IREPH duplication loops can be used in a form and can also be nested. Horizontal duplication loops (IREPH/ IREPE) can also be used in conjunction with IREPV. Each IREPV must have a corresponding IREPE.

Example The following command repeats "IGP" 3 times vertically using the IREPV, command, separating each line with 3 tenths plus 4 dots of vertical spacing.

```
^PY^-^F^-
^IREPV,3,4^G^M02,02,000IGP^-^IREPE
^O^-^PN^-
```

Dynamic Form Commands

Purpose Permits an entire form or label to be sent to VGL with variable data entered into specific locations on each form.

Mode Graphics with a Standard Graphic Command selected

Format (cc) B (cc)- *data* (cc)*t*

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
B	Specifies the Dynamic Form command. Enter **B** to begin dynamic forms.
(cc)-	The Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to terminate the initial Dynamic Form command sequence.
data	Represents the dynamic form data. Any text, graphics command sequences, or Dynamic Form Field Length, Copy or Repeat commands are entered as part of the data. (See Comments.) This is not the dynamic data for the *variable* fields; this data represents all information required for the boilerplate form.
(cc)*t*	Terminates the complete Dynamic Form command sequence. Enter the SFCC for your VGL configuration immediately followed by **]** or **}** to terminate the Dynamic Form processing. The dynamic data for the variable fields can be sent following termination of the completed Dynamic Form command.

Comments

Dynamic form commands allow a boilerplate form to be transmitted once. The data that changes with each form is provided in the variable data fields after the Dynamic Form command is terminated. Variable fields can include barcode data fields.

The Dynamic Form commands consist of the primary Dynamic Form command referenced above, which enables dynamic form generation, and three additional commands listed below. These additional commands are added to the primary command according to your particular dynamic form requirements:

- **Dynamic Form Field Length** (defined on page 67) specifies the number of data bytes expected to fill a variable data field.
- **Dynamic Form Copy Fields** (defined on page 69) copies fields within the form.
- **Dynamic Form Repeat Form** (defined on page 71) repeats the complete form.

Dynamic Form Special Command Definitions

The graphics carriage return, line feed, form feed, vertical tab, and universal terminator commands are interpreted differently when used within the Dynamic Form commands. These interpretations are described below.

(CR) Carriage Return (^-) - Fills the remainder of the current dynamic field with spaces. If this is the only input, the entire field is filled with spaces.

(LF) Line Feed (^*) - Fills (pads) the remainder of the current dynamic field and all remaining dynamic fields in the form with spaces. If this is the only input, the entire field is filled with spaces. If used within a dynamic copy command, all fields to the end of the current copy are filled with spaces. If used with a dynamic repeat command, all remaining fields of all copies are filled with spaces.

(FF) Form Feed (^,) - Performs the same function as LF, except for use within a dynamic copy command. If used within a dynamic copy command, all fields to the end of copy are filled with spaces, and all fields continue to fill with spaces until the copy count is complete.

(VT) Vertical Tab (^+) - Causes the remainder of the current dynamic field to be ignored. No data is printed in the current dynamic field if this is the only input in the field.

(G) Universal Terminator (^G) - Terminates the dynamic Form function and completes the current graphics command sequence.

Example Examples using the Dynamic Data command features are provided following the discussion of each command.

Dynamic Form: Field Length

Purpose Assigns a field length to each variable field in a boilerplate dynamic form.

Format (cc) *t length* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
t	Specifies the Dynamic Form Field Length command. Enter **[** or **{** to designate a field length follows.
length	Represents the field length. Enter a three-digit number to inform VGL how many data bytes are expected to fill a certain variable data field. Each variable data field on the form must have an associated field length.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

This Dynamic Form: Field Length command is supplied as part of the data within the Dynamic Form command. The length is assigned to a variable field at the current position based on all other commands and data within the Dynamic Form command. For example, if alphanumeric commands are input followed by a tab followed by this length command, the length is assigned beginning at the position after the alphanumeric command and tab are executed.

Each variable field in a boilerplate dynamic form must have a field length assigned. The field length specifies how many data bytes are required to fill the field. For example, a form might have a variable field called "quantity" which could be specified as three data bytes. VGL would then expect three data bytes supplied dynamically to fill that field.

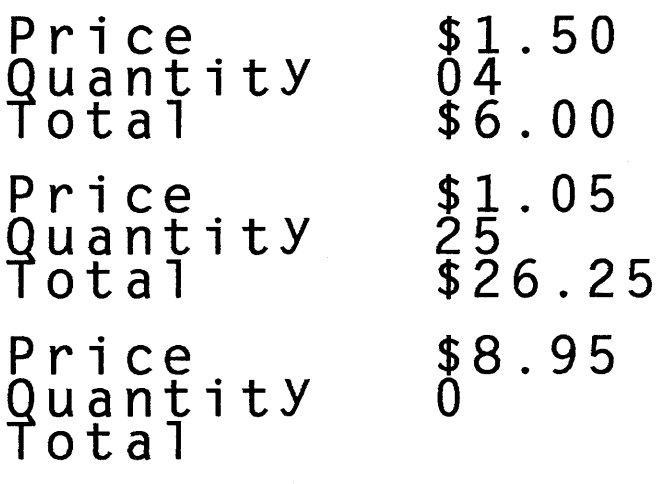
Following the completed Dynamic Form command, the data is sent and the forms are processed. The data is sent in the order of the variable fields. The first data sent fills the first variable field; the second data sent fills the second variable field, etc. The data must be the same length as the field or special dynamic form commands (CR, LF, FF explained on page 66) must be used to fill the field.

Example This example illustrates the Dynamic Form command. Three variable fields are used: one each for Price, Quantity, and Total. Following the command sequence, the dynamic data is sent to fill the variable fields. The special use of the CR command for dynamic forms is shown in the example with the dynamic data.

```
^PY^-^F^-
^B^-^M02,02,000Price^T0220^[005^-
^M02,02,002Quantity^T0220^[002^-
^M02,02,002Total^T0220^[006^-^*^*^]
$1.5004$6.00^-
$1.0525$26.25
$8.950^-
^G
^O^-^PN^-
```

Three sets of dynamic data in this example are defined as follows:

1. $1.50 Price, 04 Quantity, $6.00 Total, CR to fill with spaces
2. $1.05 Price, 25 Quantity, $26.25 total
3. $8.95 Price, 0 Quantity, CR to fill with spaces
4. End of data (^G)



Dynamic Form: Copy Fields

Purpose Duplicates specific fields or data within a boilerplate dynamic form.

Format (cc) C # *copydata* (cc)Z(cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
C	Specifies the Dynamic Form Copy Fields command. Enter **C** to copy fields within the form.
#	Specifies the number of copies. Enter a two-digit number to inform VGL how many copies of the copy data to make within the form.
copydata	Represents the copy data. Any text or graphics command sequences (including Dynamic Form Field Length) are entered as part of the data. This is *not* the dynamic data for the variable fields; this data represents all information to copy within the boilerplate form.
(cc)Z(cc)-	Terminates the copy sequence. Enter the SFCC for your VGL configuration immediately followed by **Z**, another SFCC, and **-** or another valid graphics command mnemonic to terminate the Dynamic Form Copy Fields sequence.

Comments

The dynamic copy command is supplied as part of the data within the Dynamic Form command. Do not use this command with the Dynamic Form: Repeat command (page 71).

The LF and FF commands (as previously described on page 66) have an additional meaning when used with Dynamic Form: Copy Fields commands.

Example The following example illustrates the Dynamic Form: Copy Fields command. As in the previous example (page 68), the same three variable fields are used for Price, Quantity, and Total, except that the Price and Quantity fields are copied. Following the Dynamic Form command sequence, the dynamic data is sent to fill the variable fields. The special use of the LF command for dynamic form copy fields is shown in the example with the dynamic data.

```
^PY^-^F^-
^B^-^M02,02,000Price^T0160^[005^*^*
^C02^M01,01Quantity^T0100^[002
^M01,01^T0170Total^T0250^[006^-
^*^Z^-^*^*^]
$1.5004$06.00
10$15.00
$1.0525$26.25
50$52.50
$8.9502$17.90
^*
$8.95^,
```

```
^G
^O^-^PN^-
```

The dynamic data in the above example is defined below.

1. $1.50 Price, 04 Quantity, $06.00 Total
2. 10 Quantity, $15.00 Total
3. $1.05 Price, 25 Quantity, $26.25 Total
4. 50 Quantity, $52.50 Total
5. $8.95 Price, 02 Quantity, $17.90 Total
6. End of data in these fields (^*)
7. $8.95 Price, 0 Quantity, and FF to fill all fields with spaces until copy count is complete.
8. End of data (^G)

Dynamic Form: Repeat

Purpose Repeats (duplicates) an entire form within a boilerplate dynamic form.

Format (cc) R *formdata* (cc)Z(cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
R	Specifies the Dynamic Form: Repeat command. Enter **R** to repeat the boilerplate form.
formdata	Represents the dynamic form data. Any text, graphics command sequences, or dynamic form field length, are entered as part of the data. This is *not* the dynamic data for the variable fields; this data represents all information required for the boilerplate form to be repeated. The number of copies of the form is specified as part of the dynamic data sequence after the dynamic form is processed.
(cc)Z(cc)-	Terminates the repeat sequence. Enter the SFCC for your VGL configuration immediately followed by **Z**, another SFCC, and **-** or another valid graphics command mnemonic to terminate the Dynamic Form Copy Fields sequence.

Comments

The Dynamic Form: Repeat command is supplied as the first input of the data parameter within the Dynamic Form command. Do not use this command with the Dynamic Form: Copy Fields command (page 69).

The LF and FF commands (as previously described on page 66) have an additional meaning when used with Dynamic Form: Repeat commands.

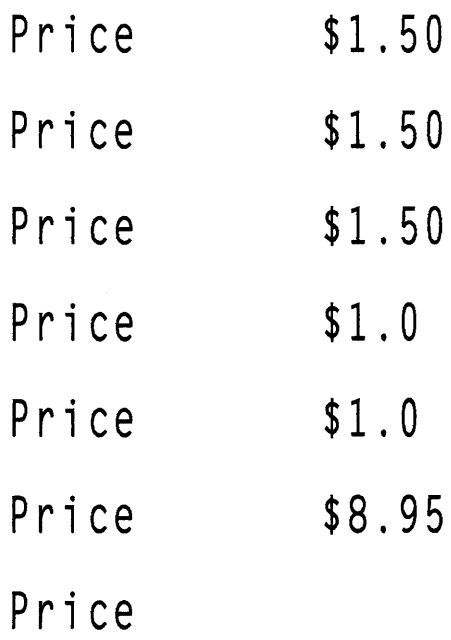
When the data is supplied, the first parameter becomes a four-digit repeat number field. For example, 0003 before the first dynamic data byte specifies three repeated forms with the data. The repeat number field must be supplied with each set of data when the Dynamic Form: Repeat command is used. If only one copy of the form is required, enter 0001 as the repeat number.

Example This example illustrates the Dynamic Form: Repeat command. The Price field repeats with a five-digit field length. Following the Dynamic Form command sequence, the dynamic data with the repeat quantities is sent. The special use of the CR command for dynamic forms is shown in the example with the dynamic data.

```
^PY^-^F^-
^B^-^R^-^M00,00,000^T0160Price^[005^-
^*^*^Z^-^]
0003$1.50
0002$1.0^-
0001$8.95
0000^G
^O^-^PN^-
```

The dynamic data in this example is defined as:

1. 3 copies with $1.50 Price
2. 2 copies with $1.0 Price, CR to fill with spaces
3. 1 copy with $8.95 Price
4. No data (^G)



Electronic Vertical Format Unit (EVFU)

Purpose To use the software-controlled vertical formatter which allows you to program frequently used lines on forms and documents for efficient printing processes when merging operations (such as invoicing or payrolling).

Mode Graphics with a Standard Graphics Command selected

Format See Table 7.

NOTE: The codes in Table 7 are not supported on L7032 printers.

Table 7. EVFU Command Codes

EVFU Code	Command
Start Load	^ >
Channel: 1 (TOF)	^ 0
Channel 2	^ 1
Channel 3	^ 2
Channel 4	^ 3
Channel 5	^ 4
Channel 6	^ 5
Channel 7	^ 6
Channel 8	^ 7
Channel 9	^ 8
Channel 10	^ 9
Channel 11	^ :
Channel 12	^ ;
Channel 13	^ <
Channel 14	^ =
End Load	^ ?

Comments

By flagging each line to be printed, the EVFU automatically moves the printhead to the identified lines. The EVFU provides 14 channels (line identification codes) to identify up to 132 lines on a form. For complete EVFU information, refer to your *Line Printer Plus Programmer's Reference Manual*.

The EVFU is loaded with a program of line identification codes, one code for each line of the form. The program includes a Start Load code to initiate the load routine, a series of line identification codes, and an End Load code. After the memory is loaded, a line identification code occurring in the data stream causes the EVFU to slew to the identified line. To clear the EVFU memory, send a Start Load code with no channel codes or End Load code.

The Start Load, End Load, and Channel Code commands are listed in Table 7. A sample EVFU form is shown in Table 8.

Table 8. Sample EVFU Form

Form Data		Form Line #	EVFU Load Program	EVFU Command Code
			Start Load	^>
		1	Ch 2	^1
		2	Ch 2	^1
Company:	Timmy’s Toys	3	Ch 1	^0
		4	Ch 2	^1
		5	Ch 2	^1
		6	Ch 2	^1
		7	Ch 2	^1
Item:	Tricycle	8	Ch 3	^2
		9	Ch 2	^1
Color:	Red	10	Ch 4	^3
		11	Ch 2	^1
		12	Ch 2	^1
Quantity:	45	13	Ch 5	^4
		14	Ch 2	^1
		15	Ch 2	^1
P/O Number:	TT-1203	16	Ch 6	^5
		17	Ch 2	^1

Table 8. Sample EVFU Form

Form Data		Form Line #	EVFU Load Program	EVFU Command Code
		18	Ch 2	^1
Date:	12/24/86	19	Ch 7	^6
		20	Ch 2	^1
			End Load	^?

The format for the form definition program sent from the host computer is as follows:

1. The EVFU Start Load code (^>) is sent first. VGL must be in the Graphics Mode to load and use the EVFU in the Graphics Mode.
2. The Channel 2 code (^1) is sent twice to assign the first two lines of the form as fillers. Filler lines are not called by the print program. The same channel code can be used to assign all filler lines of the form.
3. The Channel 1 code (^0), the top-of-form (TOF) code, is sent to assign form line number 3. This is the first line of the form with print data. In the sample form, this line is used for company name information. (Alternately, the TOF code could be assigned to the first line of the form and a unique channel code assigned to line 3.)
4. The Channel 2 code is again sent four times to assign line numbers 4 through 7 as fillers.
5. The Channel 3 code (^2) is sent to assign line number 8. In the sample form, this line is used for item information.
6. The Channel 2 code is sent to assign line number 9 as a filler.
7. The Channel 4 code (^3) is sent to assign line number 10. In the sample form, this line is used for color information.
8. The Channel 2 code is sent twice to assign line numbers 11 and 12 as a fillers.
9. The Channel 5 code (^4) is sent to assign line number 13. In the sample form, this line is used for quantity information.
10. The Channel 2 code is sent twice to assign line numbers 14 and 15 as a fillers.
11. The Channel 6 code (^5) is sent to assign line number 16. In the sample form, this line is used for purchase order number information.
12. The Channel 2 code is sent twice to assign line numbers 17 and 18 as a fillers.
13. The Channel 7 code (^6) is sent to assign line number 19. In the sample form, this line is used for date information.
14. The Channel 2 code is sent to assign line number 20 as a filler.
15. The EVFU End Load code (^?) is sent last to terminate the memory load routine.

After the EVFU is loaded, sending one of the EVFU codes in the data stream (or as a line terminator) causes the printer to slew the paper to the line assigned to the EVFU code sent.

Emphasized Print

Purpose Selects emphasized (bold) character printing.

Mode Graphics with a Standard Graphics Command selected

Format (cc) @ E (cc)-

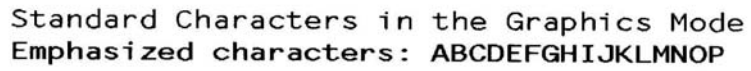
(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
@	Specifies one of the @ commands. Enter @ to begin an @ command function.
E	Specifies the Emphasized Print command. Enter **E** and all characters on the line are emphasized. Emphasized print is automatically reset upon receipt of the line terminator.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

Emphasized print is available when VGL is in the Graphics Mode. Emphasized print is a line-by-line print attribute; it is selected once and all characters in the line are emphasized. The **@E** command must be used prior to any printable data in the line, and it is automatically reset when a line terminator is received. When printing text, this command produces the same output as the Dark Print command.

Example The following example illustrates changing character type from the standard characters to emphasized characters.

```
^PY^-
Standard Characters in the Graphics Mode^*
^@E^-Emphasized characters: ABCDEFGHIJKLMNOP^*^*
^PN^-
```



Emulation Switch

NOTE: The Emulation Switch command is not supported on L7032 printers.

Purpose Switches to a different emulation.

Mode Graphics with a Standard Graphics Command selected

Format (cc) IEMUL, *des* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
IEMUL,	The emulation switch command. Enter **IEMUL,**.
des	Enter **PGL** to switch to PGL emulation. Enter **PPI1** to switch to ZGL emulation.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments Once the system is switched to a new emulation, VGL will be reset as the default. There is no need to exit the graphic mode separately.

Font Load

Purpose Load binary TrueType font (.ttf) or Intellifont (.sf) into RAMDISK or flash memory.

Mode Standard Graphics mode

Format (cc)ILOAD, *name*, *size* [,DISK] (cc)G *data* (cc)G(cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
ILOAD,	The font load command. Enter **ILOAD,**.
name	Specify associated binary TrueType font or Intellifont data by name. Enter the name of the font, including its extension. The maximum length of the name is 8 characters and the maximum length of the extension is 3 characters. For example, **93952.sf** specifies Courier Bold (Intellifont) and **arial.ttf** would represent Arial (TrueType). The name is used by (cc) IFONT,N command.
size	Enter the size, in bytes, of the binary TrueType font or Intellifont data.
DISK	Optional parameter to store the binary data in flash memory. Enter **DISK**. By default, the binary data is stored in RAMDISK when DISK is not specified.
(cc)G	The universal terminator. Enter the SFCC for your VGL configuration immediately followed by **G** to terminate the ILOAD, command.

data The binary TrueType font or Intellifont data to be stored in memory.

(cc)G The universal terminator. Enter the SFCC for your VGL configuration immediately followed by **G** to terminate the binary font *data* parameter.

(cc)- Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comment When loading fonts to RAMDISK, the printer files will not be saved to RAMDISK when the printer is powered off. When loading fonts to flash memory, the printer files will be saved when the printer is powered off. Both RAMDISK and flash memory support file operations such as saving, reading, and deleting files.

Font, Selecting Default (Version II)

Purpose Selects a default font.

Mode Standard Graphics or Graphics with an Extended Graphics Command selected. When this command is executed as an Extended Graphics command, descender mode automatically turns on.

Format (cc) IFONT,S, *n* (cc)G
or
(cc) IFONT,N, *name* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IFONT, Specifies the IFONT command. Enter **IFONT,**.

S,*n* Represents the selected font value. Enter **S,**. Replace *n* with a value ranging from **1** through **13**, or **100** or **101**, according to the IFONT values shown in Table 9 or as shown in the Font Values section below.

N,*name* Represents the selected TrueType font or Intellifont (AGFA) by name. Enter **N,** and the *name* of the font with its extension. The maximum length of the name is 8 characters and the maximum length of the extension is 3 characters. For example, **93952.sf** specifies Courier Bold (AGFA) and **arial.ttf** represents Arial (TrueType). If this parameter is used, then IFONT S, should not be used.

(cc)G The universal terminator. Enter the SFCC for your VGL configuration immediately followed by **G** to terminate the IFONT,S, command.

Table 9. IFONT, Values

Font # (*n*)	Font Description
1	Draft 10 cpi
2	Draft 12 cpi
3	Draft 15 cpi
4	Draft 7.5 cpi
5	NLQ 10 cpi
6	NLQ 12 cpi
7	NLQ 13.33 cpi
8	NLQ 15 cpi
9	NLQ 17.65 cpi
10	OCR-A Size 1 10 cpi
11	OCR-B Size 1 10 cpi
12	Draft 10 cpi
13	Draft 10 cpi
100	20 cpi
101	24 cpi
xxxxx	AGFA font or Bitmap font

NOTE: For thermal printers a Letter Gothic font at the higher quality NLQ is always used.

Comments

When this command is used within an Extended Graphics command, the default font is selected for Extended Graphics printing and the four orientations of the Alphanumerics command (page 32) are available. When this command is used in a Standard Graphics command, the default font is selected for standard printing only.

Font Values

The ^IFONT,S command is used to select proportional fonts. The following list indicates each of the font values and how they are used:

0 - 199	These values are already defined. When the ^IFONT command is received with one of these values, it selects the standard font (Letter Gothic) and selects the CPI (as shown in Table 9).
89001 - 89003	These values select an Printronix bitmap font on the flash memory. The least significant digit indicates which font is selected (for example 89001 selects bitmap font 1). See “Bitmap Fonts” below.
90000 - 99999	These values select a Printronix proportional font, as described below.

Font Selection

Fonts are selected using the ^IFONT command, as follows:

^IFONT,S,*XXXXX*^G

The parameter *XXXXX* indicates the font selected. The rest of the command is parsed and acted upon based upon the font number selected.

^IFONT,N,*name*^G

Represents the selected TrueType font or Intellifont (AGFA) by name. Enter **N,** and the *name* of the font with its extension. The maximum length of the name is 8 characters and the maximum length of the extension is 3 characters.

Bitmap Fonts

Font values of 89001 - 89003 select a bitmap font. The size of the font is determined by the font. The font on the flash memory is in the HP® PCL® Bitmap format. The file names for the fonts are CUSTOM*x*.FNT (where *x* is the font number from 1 through 3).

Printronix/AGFA Fonts

Font values of 90000 - 99999 select an AGFA font. When using an AGFA or TrueType font, additional optional parameters are available to modify the font. The syntax for selecting an AGFA font is:

^IFONT,S*,XXXXX* [,BOLD] [,RSLANT / ,LSLANT] [*POINT* [,*WIDTH*]]^G

The syntax for selecting an AGFA or TrueType font by name is:

^IFONT,N*,name* [,BOLD] [,RSLANT / ,LSLANT] [*POINT* [,*WIDTH*]]^G

The parameter *XXXXX* indicates the font to be selected, by number. If the font number is an AGFA font (value 90000 - 99999), then it selects the desired AGFA font, and also interprets the optional parameters. If a bitmap font is selected (value 89001 - 89003), then the font is selected, but no optional parameters are allowed. The *name* parameter indicates the font to be selected, by name (e.g. “arial.ttf”)

If the **,BOLD** parameter is specified, the font is printed in bold. If the **,RSLANT** or **,LSLANT** parameter is specified, the font is printed slanted to the left or right (pseudo-italics).

If the ***POINT*** parameter is specified, it selects the height (point size) of the text. This is a numeric value in 1/4 points (1/288"). In addition if the ***POINT*** parameter is specified a ***WIDTH*** parameter may also be specified. If given, it is in 1/4 points (or 1/288"). If it is 0 or is not given, the standard aspect ratio is used.

The file name on the flash memory for the AGFA fonts is ***XXXXX*.SF**, where *XXXXX* is the font number.

Pass-through Mode

If the font is selected in standard graphics mode, it applies to all text in standard graphics mode. In addition, this font applies to text printed when outside graphics mode (i.e. after VGL is terminated with the ^PN^- command). If the UNIFORM FONTS menu selection is ENABLED, the typeface also applies to text within extended graphics mode. If it is DISABLED, the standard font is used within extended graphics mode, and returns to the selected font when the graphic pass is terminated.

Extended Graphic Mode

If the font is selected when in extended graphics mode, the font selected is the selected font for this graphics pass. If the UNIFORM FONTS selection is ENABLED, it also affects the typeface used for standard graphics mode text and future graphic passes. If the UNIFORM FONTS selection is DISABLED, it does not affect the font for standard graphics mode text or future graphic passes.

Examples

The following examples illustrate how to select a font using the **IFONT,S,** and **IFONT,N,** formats.

Example 1. To print “This is Courier font” in Courier font face:

```
^PY^-^M0202000^IFONT,S,93952^GThis is Courier font^-^PN^-
```

Example 2. To print “This is TrueType font” in Arial font face:

```
^PY^-^M0202000^IFONT,N,arial.ttf^GThis is TrueType font^-^PN^-
```

Fonts, Rotatable

Purpose Using special parameter values within any of the four alphanumerics commands described on page 32, you can specify four different fonts.

Mode Normal resolution Graphics with an Extended Graphics Command selected.

Format (cc) *expand font jus data* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
expand	Represents one of the alphanumeric command mnemonics: Enter **M** for horizontal, **V** for clockwise, **E** for counterclockwise, or **U** for inverted.
font	Represents the four-digit font parameter value which selects the font. Font parameter values are shown in Table 10.
jus	Normal Resolution: Defines vertical justification (position) for character printing in tenth inches and dot rows. Enter a three-digit value ranging from **000** through **999** to define the printing location down from the starting position of the command sequence. The first two digits specify 0.1 through 9.9 inches downward justification; the third digit specifies an additional 0 through 9 dot rows of downward justification. The decimal point between the first two digits is automatically understood by VGL and the third digit is automatically interpreted as dot rows. High Resolution: Defines the horizontal length of the form in thousandth inches. Enter a five-digit horizontal value ranging from **00000** through **99999** to define a horizontal length of 0.000 inch to 99.999 inches. VGL automatically understands the decimal between the second and third digits.

NOTE: If your data to be printed begin with a number (not a character), then you must complete the field; otherwise, VGL assumes the number is a digit in the field value.

data The data characters for printing in the rotatable font.

(cc)- Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

Compressed Print Density Fonts provide six other fonts with higher density print characteristics. See “Fonts, Compressed Print Density” on page 85.

Each of the three pitches, 10 cpi, 12 cpi, and 15 cpi (measured in characters per inch, cpi) produce non-expandable characters 0.1-inch high and 3, 4, or 5 dot columns wide with a one-dot column intercharacter spacing.

The 7 cpi font produces non-expandable characters 0.2-inch high and 0.15-inch wide with a 2-dot column intercharacter spacing at approximately 7 cpi.

You can select any specific font from any of the four alphanumerics commands using the Font Parameter (special combinations of the alphanumeric command height and width parameters) as described in Table 10.

The Rot. Char Size option setting (from the front panel menu) determines if rotated (clockwise / counter-clockwise), expanded characters have a different size than an unrotated character with the same size parameters ("Adjusted") or the same size ("Not Adjusted"). The previous VGL version always operated in the Adjusted mode.

The Adjusted mode reflects rotating a fixed 5x7 cell character on a 60x72 dpi, non-symmetrical printer. The Not Adjusted mode reflects rotating on a symmetrical dpi printer.

Table 10. Rotatable Fonts

Font Size	Impact Printer Character Dimensions* (Vert X Horiz)	Alphanumeric Command Font Parameter Value
7 cpi	14 dots (V) X 8 dots	00,00
10 cpi	7 dots (V) X 5 dots	01,01
12 cpi	7 dots (V) X 4 dots	00,01
15 cpi	7 dots (V) X 3 dots	01,00

* 10, 12, and 15 cpi use an intercharacter spacing of one dot position. The elongated font uses an intercharacter spacing of two dot positions. Vertical by horizontal dimensions above are based on the 60 X 72 dpi dots produced on line matrix printers.

Examples The following examples illustrate the available fonts. For each example, the Graphics Mode command (^PY^-) was previously sent but not shown.

10 cpi Font - The following command generates the uppercase alphabet with numbers 0-9 in 10 cpi:

```
^M01,01,000ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

12 cpi Font - The following command generates the uppercase alphabet with numbers 0-9 in 12 cpi:

```
^M00,01,000ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

15 cpi Font - The following command generates the uppercase alphabet with numbers 0-9 in 15 cpi:

```
^M01,00,000ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

7 cpi Font - The following command generates the uppercase alphabet with numbers 0-9 in 7 cpi:

```
^M00,00,000ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

Rotatable Font - The following commands combine rotated fonts with alphanumeric commands.

```
^M05,05,000IGP^M01,01,000IGP^-
```

IGP IGP

```
^V03,03,0003 X 3^V01,00,000IGP^-
```

Fonts, Compressed Print Density

Purpose Defines the horizontal print density in characters per inch (cpi).

Mode Graphics with an Extended Graphics Command selected

Format (cc) S *f data* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
S	The Compressed Print Density command. Enter **S**.
f	Represents the Compressed Print Density font. Replace *f* with a value ranging from **1** through **9** to select the compressed print density font as described in Table 11. Standard print density is 10 cpi. Each character font is .1-inch high. The font sizes are illustrated in the examples beginning on page 87.
data	The data characters for printing in the Compressed Print Density font.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your configuration immediately followed by **-** to end the command sequence.

Table 11. Compressed Print Density Font Selection

f	Font Selected
1	10 cpi
2	12 cpi
3	13.33 cpi
4	15 cpi
5	17.65 cpi
6	OCR-A font at 10 cpi
7	OCR-B font at 10 cpi
8	12 cpi
9	15 cpi

Comments

Use Compressed Print Density commands as part of the Alphanumerics command. Reverse print and rotated commands are not available with the Compressed Print feature. Characters selected with this command print only in the standard horizontal orientation. A Reverse Print or rotated alphanumeric command specified in the command sequence is ignored.

Compressed Print Density Font Examples

The following examples illustrate the commands and print samples which generate the uppercase alphabet with numbers 0-9 in the available compressed print density fonts. Notice the height and width parameters of the alphanumerics command does not apply to the data specified for compressed print.

f = 1 (10 cpi)

```
^PY^-
^M03,02,000^S1ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
^PN^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

f = 2 (12 cpi)

```
^PY^-
^M03,02,000^S2ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
^PN^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

f = 3 (13.33 cpi)

```
^PY^-
^M03,02,000^S3ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
^PN^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

f = 4 (15 cpi)

```
^PY^-
^M03,02,000^S4ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
^PN^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

f = 5 (17.65 cpi)

```
^PY^-
^M03,02,000^S5ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
^PN^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

f = 6 (OCR-A 10 cpi)

```
^PY^-
^M03,02,000^S6ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
^PN^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

f = 7 (OCR-B 10 cpi)

```
^PY^-
^M03,02,000^S7ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789^-
^PN^-
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789

Form Feed

Purpose Performs a form feed (hex 0C) function to advance the paper to the next top of form, or may be used to terminate a graphics command.

Mode Graphics with a Standard Graphics Command selected

Format (cc),

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
,	The graphics FF mnemonic. Enter **,**.

Comments

The form feed command functions as a terminator only when used to terminate a graphics sequence in a graphics command when Free Format is enabled.

The control panel form feed key will operate differently dependent on the source of form feed control at the time the key is pressed. Form feed is controlled by the LP+ and VGL emulation at different times.

Form Length

Purpose Defines the length of the form in total number of lines.

Mode Graphics with a Standard Graphics Command selected

Format (cc) L *length* (cc)-
or
(cc) H *length* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
L or H	The Form Length command. If your VGL is configured with the PI line enabled, enter **L**. If your VGL is configured with the PI line disabled, enter **H**.
length	Represents the form length in total number of lines. Enter a two-digit number of total lines on the form ranging from **01** through **99**. For example, enter 05 for a 5-line form length, 21 for a 21-line form length.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The L command is available any time VGL is in the Graphics Mode. The physical length of the paper for the form is a product of the total lines per form and the current lines per inch (lpi) setting for the printer. For example, a typical 66-line form at 6 lpi is 11 inches long. A 48-line form at 6 lpi is 8 inches long; the same 48-line form at 8 lpi is 6 inches long.

Form feeds following this command advance the form from the current print position to the top of the next form.

With the Host Form Length configuration option enabled, the form length defined by this command sets the physical page length on the printer.

Forms Construction

Purpose Produces vertical lines inside a box to construct forms.

Mode Graphics with an Extended Graphics Command selected

Format (cc) LF *horz vert h v line1 t line2 t* (cc)G(cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

LF The Forms Construction command. Enter **LF**.

horz Normal Resolution:
Defines the horizontal length of the form in tenth inches and dot columns. Enter a three-digit horizontal length value ranging from **000** through **999** to define a horizontal length of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot columns of length. VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot columns. For example, entering 0126 specifies a 1.2-inch plus 6-dot column horizontal length; entering 1016 specifies a 10.1-inch plus 6-dot column horizontal length.

High Resolution:
Defines the horizontal length of the form in thousandth inches. Enter a five-digit horizontal value ranging from **00000** through **99999** to define a horizontal length of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits. The *horz* field must be at least twice the value of the thickness of the vertical sides (*v*).

vert Normal Resolution:
Defines the vertical length of the form in tenth inches and dot rows. Enter a three-digit vertical length value ranging from **000** through **999** to define a vertical length of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot rows of length. VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot rows. For example, entering 0204 specifies a 2.0-inch plus 4-dot row vertical length; entering 0242 specifies a 2.4-inch plus 2-dot row vertical length.

vert

High Resolution:
Defines the vertical length of the form in thousandth inches. Enter a five-digit vertical value ranging from **00000** through **99999** to define a vertical length of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits. The *vert* field must be at least twice the value of the thickness of the horizontal sides (*h*).

h

Normal Resolution:
Defines the horizontal border thickness in dot columns. Enter a number ranging from **1** through **9** to specify a horizontal border thickness from 1 through 9 dots.

High Resolution:
Defines the horizontal border thickness in thousandth inches. Enter a number ranging from **000** through **999** to specify a border thickness from 0.000 through 0.999 inch. VGL automatically understands the decimal before the first digit.

v

Normal Resolution:
Defines the vertical border thickness in dot rows. Enter a number ranging from **1** through **9** to specify a vertical border thickness from 1 through 9 dots.

High Resolution:
Defines the vertical border thickness in thousandth inches. Enter a number ranging from **000** through **999** to specify a border thickness from 0.000 through 0.999 inch. VGL automatically understands the decimal before the first digit.

line1

Normal Resolution:
Defines the vertical line position in tenth inches and dot columns from the form left edge or prior vertical line right edge. Therefore, the line value for all but the first vertical line is actually the gap between the right edge of the previous line and the left edge of the current line. Enter a three-digit position value ranging from **000** through **999** to define a position of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot columns. VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot columns. For example, entering 0126 specifies a 1.2-inch plus 6-dot column position from the left edge or last vertical line position; entering 1016 specifies a 10.1-inch plus 6-dot column position.

line1 — High Resolution:
Defines the vertical line position in thousandth inches from the form left edge or prior vertical line right edge. The line value for all but the first vertical line, therefore, is actually the gap between the right edge of the previous line and the left edge of the current line. Enter a five-digit position value ranging from **00000** through **99999** to define a position of 00.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits.

t — Normal Resolution:
Defines the vertical line thickness in dot columns. Enter a number ranging from **1** through **9** to specify a line thickness from 1 through 9 dots.

High Resolution:
Defines the vertical line thickness in thousandth inches. Enter a number ranging from **000** through **999** to specify a line thickness from .000 inch through .999 inch.

line2 — The line position parameter is entered repeatedly as needed for the number of lines required in the form.

t — The line thickness parameter is entered for each vertical line position parameter.

(cc)G — Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command to end the input of vertical line and form data.

(cc)- — Graphics Mode CR used as a sequence terminator. Enter the SFCC for your configuration immediately followed by **-** to end the command sequence.

NOTE: You must supply leading and trailing zeros for all fields.

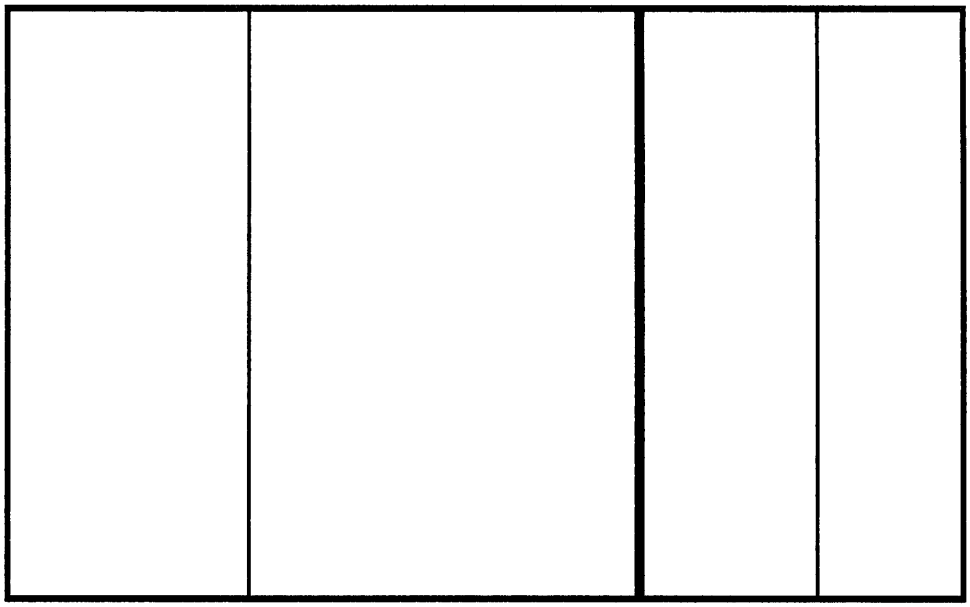
Comments

The **LF** command produces vertical lines inside a box using a single command sequence. Forms are positioned by the parameters or commands of an alphanumerics command sequence (such as horizontal tabs, the justification parameter, etc.). Therefore, one of the alphanumerics commands must precede an **LF** command.

Using appropriate values for the horizontal and vertical length parameters constructs a variety of form shapes. The horizontal and vertical border thickness can also be specified in varying line thicknesses. Any number of vertical lines can be drawn inside the form. The position of the vertical line is based on the left edge of the form or the last vertical line drawn.

Example The following sample command illustrates forms construction in normal resolution. In addition to enabling the Free Format, an alphanumerics command was sent for form positioning.

```
^PY^-^F^-
^M01,01,000
^LF0500,0320,2,2,0123,1,0200,3,0090,1^G^-
^O^-^PN^-
```



Forms, Creating Dynamic (Version II)

NOTE: This command operates similar to the Dynamic Form Commands described beginning on page 65.

Purpose Creates a new dynamic form and stores it in memory under a specified name.

Mode Graphics with an Extended Graphics Command selected

Format (cc) IFORM,C *name* [,DISK] (cc)G *data* (cc)]

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
IFORM,C	The command to create buffered forms. Enter **IFORM,C**.
name	Represents the form name. Enter a name up to 15 characters long. Another form in memory by the same name is overwritten with the new form.
DISK	Optional parameter to store the form in the printer's flash memory. Enter **DISK**.

(cc)G — Terminator. Enter the SFCC for your VGL configuration immediately followed by **G,** the universal terminator, or another valid Graphics Mode command to end the input of the form name.

data — The form data. Enter any number of valid Graphics or Extended Graphics command sequences.

(cc)] — Ends the form and all contents. Enter the specific SFCC for your VGL configuration followed by the right bracket (**]**) to end the form.

Forms, Deleting Dynamic (Version II)

Purpose Deletes an existing dynamic form stored in memory under a specified name.

Mode Graphics with an Extended Graphics Command selected

Format (cc) IFORM,D *name* (cc)G

(cc) — Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IFORM,D — The command to delete the form. Enter **IFORM,D**.

name — Represents the form name. Enter the form name exactly as created in the IFORM,C command (page 93).

(cc)G — Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command terminator to end the data.

Forms, Executing Dynamic (Version II)

NOTE: This command operates similar to the Dynamic Form Commands described beginning on page 65.

Purpose Executes an existing dynamic form stored in memory under a specified name.

Mode Graphics with an Extended Graphics Command selected

Format (cc) IFORM,E *name* [,DISK] (cc)G

(cc) — Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IFORM,E — The command to execute the form. Enter **IFORM,E**.

name — Represents the form name. Enter the form name exactly as created in the IFORM,C command (page 93).

DISK — Optional parameter to print the form stored in the printer's flash memory.

(cc)G — Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command terminator to end the data.

Forms, Listing Dynamic (Version II)

Purpose Lists all previously created forms including the form size, in bytes, used by each form name.

Mode Graphics with an Extended Graphics Command selected

Format (cc) IFORM,L (cc)G

(cc) — Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IFORM,L — The command to list the forms in memory. Enter **IFORM,L**.

(cc)G — Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command terminator to end the data.

Forms, Predefined (Version II)

Purpose Loads one of three predefined forms from memory (AIAG, Primary Metals, and Odette). These forms are selected and completed using the commands and legends described.

Mode Graphics with standard Graphics Command selected

Format (cc) IFORM,E*formname*.QMS (cc)G

(cc) — Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

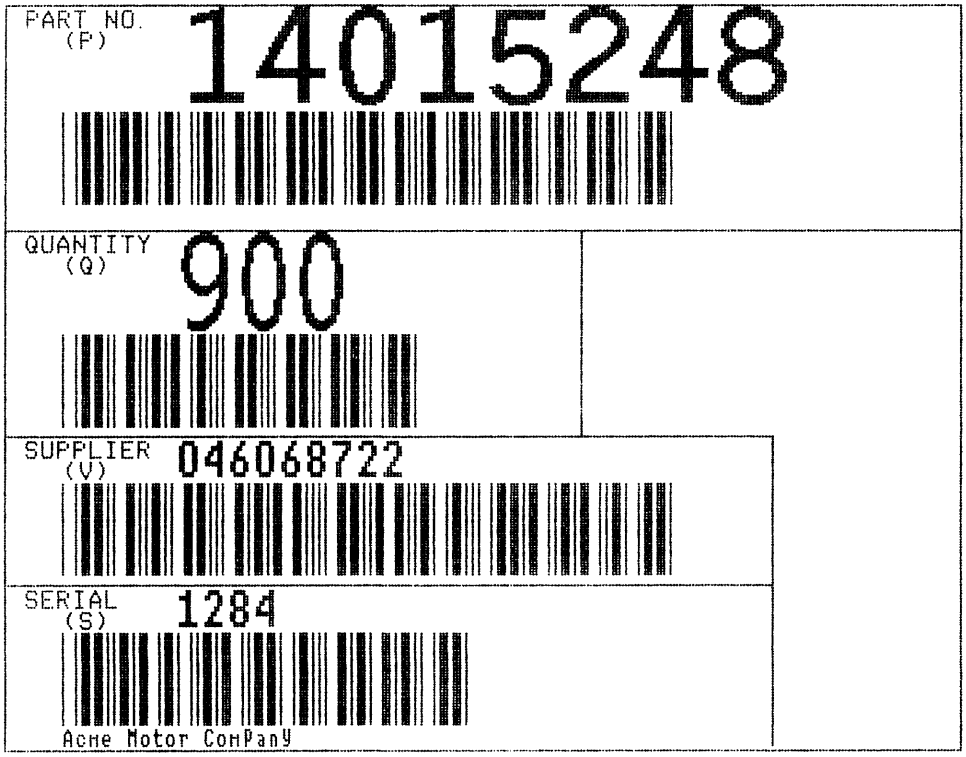
IFORM,E*formname*.QMS — The command to retrieve the specified predefined form. Enter **IFORM,E*formname*.QMS**, where *formname* ia **AIAG**, **METALS**, or **ODETTE**.

(cc)G — Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command terminator to end the data.

Comments The IFORM,E command not only loads the desired predefined form, but provides the means to fill out the form. The following three examples show the method of specifying the data to be placed on the forms.

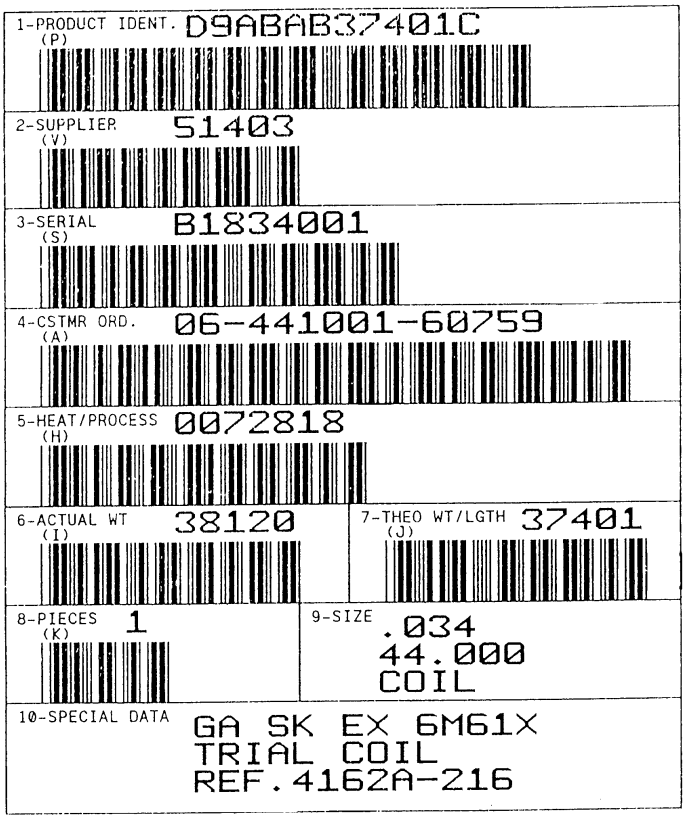
Example 1 The following sample command illustrates forms construction after loading the AIAG form from memory.

```
^PY^-^F^-
^IFORM,EAIAG.QMS^G
14015248^+
14015248^+
900^+900^+
046068722
046068722
1284^+1284^+
Acme Motor Company^+
^G
^O^-^PN^-
```



Example 2 The following sample command illustrates forms construction after loading the Primary Metals form from memory.

```
^IFORM,EMETALS.QMS^G
D9ABAB37401C^+D9ABAB37401C^+
51403^+51403^+
B1834001^+B1834001^+
06-441001-6075906-441001-60759^+
0072818^+0072818^+
3812038120
3740137401
1^+1^+
.034^+
44.000^+
COIL^+
GA SJ EX 6M61X^
TRIAL COIL^+
REF.4162A-216^+
^G
```



Example 3 The following sample command illustrates forms construction after loading the Odette form from memory.

```
^IFORM,EODETTE.QMS^G
ABC CAR CORP^+
DETROIT^+
-005^+
143576451143576451
CHICAGO^
240^+270^+
16-6^+1345935^+
1882^+1882^+
P04^+^+880223
216231627S216231627
8801006^+8801006^+
CHICAGO, IL^+^G
```

Forms, Resetting Dynamic (Version II)

Purpose Resets dynamic form memory by deleting all forms stored in memory.

Mode Graphics with an Extended Graphics Command selected

Format (cc) IFORM,R (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
IFORM,R	The command to reset forms memory. Enter **IFORM,R**.
(cc)G	Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command terminator to end the data.

Comments

Standard predefined forms are not deleted from forms memory with this command. If predefined forms were previously deleted, they are reinstalled in the forms memory after execution of this command.

Free Format (Enable/Disable)

Purpose Enables VGL to ignore all host generated paper motion commands ranging from hex 00 through 1F.

Mode Graphics with a Standard Graphics Command selected

Format (cc) F (cc)-
data
(cc) O (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
F	Specifies the Free Format command. Enter **F**.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.
data	Represents the data, commands, and all other codes for processing in Free Format. All VGL features are available with Free Format enabled.
(cc)O	Turns off the Free Format mode. Following the data for processing in the Free Format, enter the SFCC for your VGL configuration immediately followed by **O** (alpha O) to end the Free Format.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

Some host systems automatically generate forms control codes such as CR or LF after a specific number of characters. These host generated forms control codes could prematurely terminate the graphics command sequence. The Free Format command allows VGL to accept incoming data as one continuous stream even though the data stream may include host generated forms control codes.

Free Format is available when VGL is in the Graphics Mode. When enabled, VGL recognizes only the Free Format terminator commands (Table 12) for forms control until the Free Format is disabled. If the Graphics Mode is disabled, Free Format command is automatically disabled.

NOTE: Free Format commands may be used in the normal Graphics Mode even though Free Format is not enabled. However, when the Free Format command *is enabled*, the only valid terminators are the Free Format commands; others are ignored.

Table 12. Free Format Terminator Commands

Command	Meaning
^ *	Line Feed (LF)
^ ,	Form Feed (FF)
^ -	Carriage Return (CR)
^ +	Vertical Tab (VT)
^ >	EVFU Start Load
^ ?	EVFU End Load
^ 0-9	EVFU Chs 1 - 10
^ :	EVFU Ch 11
^ ;	EVFU Ch 12
^ <	EVFU Ch 13
^ =	EVFU Ch 14

Example The following command enables and disables Free Format in the Graphics Mode.

```
^PN^-^F^-
data
^O^-PN^-
```

Free Format Enable, Non-Graphics

Purpose Permits VGL to override host-generated paper motion commands when not in Graphics Mode.

Mode Normal

Format (cc) PF (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
PF	Specifies the Enable Non-Graphics Free Format command; enter **PF**.
(cc)-	Terminator. Enter the SFCC for your VGL configuration immediately followed by **-** (Graphics Mode CR) or other valid terminator.

Comments

Use the PF command with host systems that send blocks of data padded with NULs or other control characters that may interfere with a graphics sequence (such as unformatted LU 3 mode, coaxial environments). When the Graphics Mode Disable command (^PN^-) is used to exit the Graphics Mode, it also automatically terminates the Free Format command and disables the Ignore Data commands. This can result in unwanted paper motion if Graphics Mode is exited between forms or labels, since host-generated line feeds, form feeds, etc., are no longer ignored by the firmware. (Refer to the Free Format and Ignore Data commands on pages 99 and 105 for more information on these functions.)

The PF command must be issued before the Graphics Mode Enable command (PY). Host-generated line terminators are then ignored by VGL and only the following standard graphics format control commands are recognized:

(cc) *Line Feed (hex 0A)

(cc), Form Feed (hex 0C)

(cc)- Carriage Return (hex 0D)

NOTE: When VGL is in the Graphics Mode, the Enable Non-Graphics Free Format command has no effect on the host data stream. In the Graphics Mode, use the Free Format and Ignore Data commands (pages 99 and 105, respectively) to ignore unwanted data.

Example The example below illustrates the use of the Enable Non-Graphics Free Format command:

```
^PF^-(LF)(LF)(LF)(LF)^PY^-F^-^M02,02,100 data for form one
^*^X extraneous, unwanted host data^A^M01,01,000 more form one
data ^-(LF)(LF)(LF)(FF)^PN^-^*^*(LF)(LF)
^PY^-^F^-^M02,02,000 data for form two, etc.^-
```

In this example, all of the host-generated line and form feed commands, represented by (LF) and (FF), are ignored and paper motion is controlled by VGL standard graphics format control commands (^-), (^*), and (^,), even though Graphics Mode is exited and reentered between the forms. Between the forms two standard graphics line feed commands (^*) are used to move the paper instead of the host-generated (LF) commands. Notice that after the Graphics Mode is enabled, the Free Format and Ignore Data commands (^F^-), (^X), and (^A) are used to ignore the unwanted host data. When all of the labels or forms are completed, sending Free Format Non-Graphics Disable command (PO, page 102) returns VGL to the fully-transparent Normal Mode.

Free Format Disable, Non-Graphics

Purpose Disables the Non-Graphics Free Format command (PF), which allows host-generated paper motion when VGL Graphics Free Format command is disabled.

Mode Normal

Format (cc) PO (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
PO	Specifies the End Non-Graphics Free Format command; enter **PO**.
(cc)-	Terminator. Enter the SFCC for your VGL configuration immediately followed by **-** (Graphics Mode CR) or other valid terminator.

Comments

Send the PO command anytime *after* the Graphics Mode Disable command (PN).

Example The following command disables Free Format in Non-Graphics Mode.

```
^PO^-
```

Graphics Mode Enable

Purpose Enables use of Graphics Mode commands.

Mode Normal

Format (cc) PY (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
PY	Specifies the Graphics Mode Enable command; enter **PY**.
(cc)-	Terminator. Enter the SFCC for your VGL configuration immediately followed by **-** (the Graphics Mode CR) or other valid terminator.

Comments

Following the PY command, the Graphics Mode commands (page 26) are available. Once in Graphics mode, you can enter Extended Graphics/High Resolution Mode. (See page 31 for more information.)

For the Graphics Mode Enable command to be recognized and accepted by VGL, the following rules must be followed:

1. If Midline PY is enabled on the printer's control panel menu, the Graphics Mode Enable command can be placed anywhere on a line. If Midline PY is disabled, the Graphics Mode Enable command *must* be the first characters of a new line. See your *User's Manual* for more information.
2. The command line *must* also terminate with a line terminator (CR, LF, FF, etc.).
3. VGL absorbs all characters between the command and the line terminator.

Example The following command enables the Graphics Mode: `^PY^-`

Graphics Mode Disable

Purpose Exits VGL from Graphics Mode and returns to the Normal Mode.

Mode Graphics

Format (cc) PN (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
PN	Specifies the Graphics Mode Disable command; enter **PN**.
(cc)-	Terminator. Enter the SFCC for your VGL configuration immediately followed by **-** (Graphics Mode CR) or other valid terminator.

Example The following command disables the Graphics Mode:

```
^PN^-
```

Hex Dump

Purpose Prints all data in hexadecimal code equivalent.

Mode Graphics with a Standard Graphics Command selected

Format (cc) @ H 0 (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
@	Specifies one of the @ commands. Enter @ to begin an @ command function.
H	Specifies the Hex Dump command. Enter **H**.
0	Specifies the Hex Dump parameter. Enter **0** (zero).
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The @**H** command is available when VGL is in the Graphics Mode. To disable the hex dump, place the printer offline and change the hex dump parameter from Enable to Disable. Refer to your *User's Manual* for instructions.

Ignore Data

Purpose Instructs VGL to ignore data until a (cc)A command is received. (See Comments below.)

Mode Graphics with a Standard Graphics Command selected

Format (cc) X *data* (cc)A

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
X	Specifies the Ignore Data command. Enter **X** to ignore all subsequent characters until the Ignore Data command is disabled.
data	Represents the data. Any text and characters sent following the Ignore Data command are not processed.
(cc)A	Disables Ignore Data. Enter the SFCC for your VGL configuration immediately followed by **A** to disable the Ignore Data feature in order to process characters.

NOTE: No function occurs if a **(cc)A** command is used independent of the **(cc)X** command.

Comments

Some host systems use fixed record lengths which causes the end of a line of data in the data stream to be filled (padded) with characters and spaces. If VGL file on your system contains padded characters or spaces before the SFCC, this padded data must be ignored before VGL can operate. When the **X** command is sent to ignore data, all data following the command is ignored until the **(cc)A** command to ignore data is disabled.

Interrupt

Purpose In cases where a single command sequence exceeds the buffer capacity, an interrupt can be used to break the command sequence and specify the position where the sequence begins printing again.

Mode Graphics with or without an Extended Graphics Command selected

Format (cc) I *dis* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
I	Specifies the Interrupt command. Enter **I**.
dis	Normal Resolution: Defines the interrupt position in tenth inches and dot columns. Enter a two-digit interrupt position value ranging from **00** through **99** to define a position of 0.0 through 9.9 inches and a third digit ranging from 0 through 9 to specify 0 through 9 additional dot columns. VGL automatically understands the decimal between the first and second digits for tenth inches and automatically interprets the third digit as dot columns. For example, entering 126 specifies a 1.2-inch plus 6-dot column interrupt position. Setting the interrupt position parameter to all zeros processes all data in the VGL buffer before the next sequence is initiated. High Resolution: Defines the interrupt position in thousandth inches. Enter a five-digit vertical value ranging from **00000** through **99999** to define a vertical justification of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits.
(cc)-	Graphics Mode CR used as a command terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence. NOTE: Only required outside of an Extended Graphics sequence.

Comments

The VGL buffer holds and can process approximately 64K characters in a single graphics command sequence, which is sufficient for most applications. However, infrequent situations may arise where the command sequence is too large for the VGL buffer to hold for processing as a single command sequence. In such cases, use the **I** command to break the printing command sequence at a specified position and specify where the sequence resumes printing. Interrupted command sequences are processed as if a single command sequence occurred.

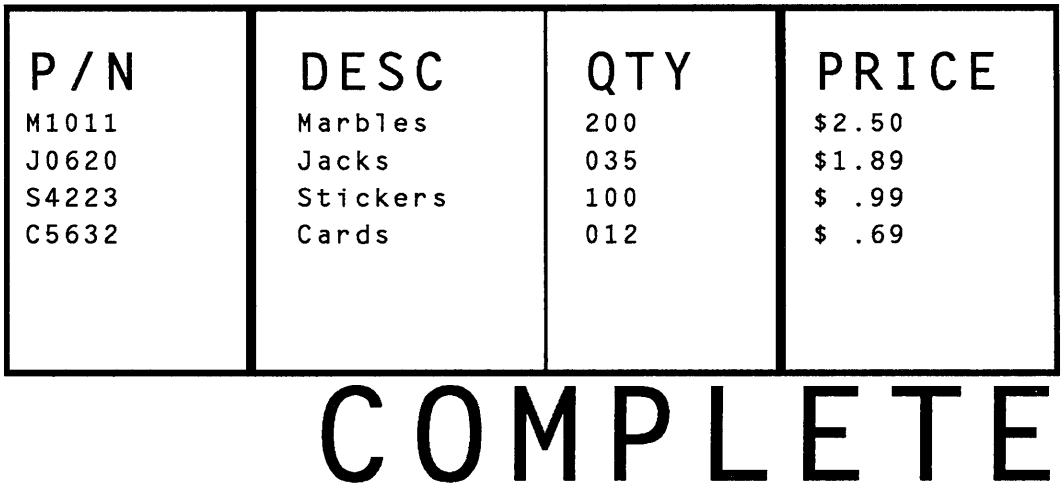
The **I** command can also be used for vertical positioning. Use the I command to skip to a new vertical position and print the data. Interrupt commands also can be included in a Vertical Duplication command sequence.

Like the Alphanumeric commands, the Interrupt command also enables extended graphics functions, if not already in an Extended Graphics sequence.

To complete the printing of all interrupted command sequences, use ^I000^- or no ^I command in the last command sequence. The last technique is used in the following example.

Example The following commands illustrate the interrupt function combined with form construction using tabs and various character parameters in normal resolution. The Free Format Enable command is also used.

```
^PY^-^F^-
^M01,01,000^LF0550,0200,2,2,0123,3,0150,1,0120,3^I020^-
^M02,02,005^T0010P/N^T0150DESC^T0300QTY^T0420PRICE^I020^-
^M01,01,020^T0010M1011^T0150Marbles^T0300200^T0420$2.50^I020^-
^M01,01,020^T0010J0620^T0150Jacks^T0300035^T0420$1.89^I020^-
^M01,01,020^T0010S4223^T0150Stickers^T0300100^T0420$ .99^I020^-
^M01,01,020^T0010C5632^T0150Cards^T0300012^T0420$ .69^I020^-
^M05,05,084^T0149COMPLETE^-
^O^-^PN^-
```



Justification, Vertical

Purpose Specifies a lower vertical print position relative to the print position of the alphanumerics command. This feature is useful for positioning data within boxes or columns on a form.

Mode Graphics with an Extended Graphics Command selected

Format (cc) J *jus* (cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

J The Vertical Justification command. Enter **J**.

jus Normal Resolution:
Defines the new vertical justification (position) for character printing in tenth inches and dot rows. Enter a three-digit value ranging from **000** through **999** to define the new print location down from the starting position of the command sequence. The first two digits specify 0.1 through 9.9 inches downward justification; the third digit specifies an additional 0 through 9 dot rows of downward justification. The decimal point between the first two digits is automatically understood by VGL and the third digit is automatically interpreted as dot rows.

High Resolution:
Defines vertical justification (position) for character printing in thousandth inches. Enter a five-digit value ranging from **00000** through **99999** to define the printing location down from the starting position of the command sequence from 0.0 inch through 99.999 inches. VGL automatically understands the decimal point between the second and third digits as thousandths.

If the data character immediately following the jus field is not a digit (zero through nine), then you can omit trailing zeros. For example, the command **^M10010000000^J01ABC**, results in a 1.000 inch justification because the three empty spaces in the jus field (before the characters "ABC") are completed with three implied trailing zero digits.

NOTE: If your data to be printed begin with a number (not a character), then you must complete the field; otherwise, VGL assumes the number is a digit in the field value.

The data to print at the new print position is input following the Character Justification Change command.

(cc)- Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

NOTE: This command causes extra vertical blank spaces at the bottom of a form if its value is greater than the bottom edge of any previously drawn graphical element in the current command sequence.

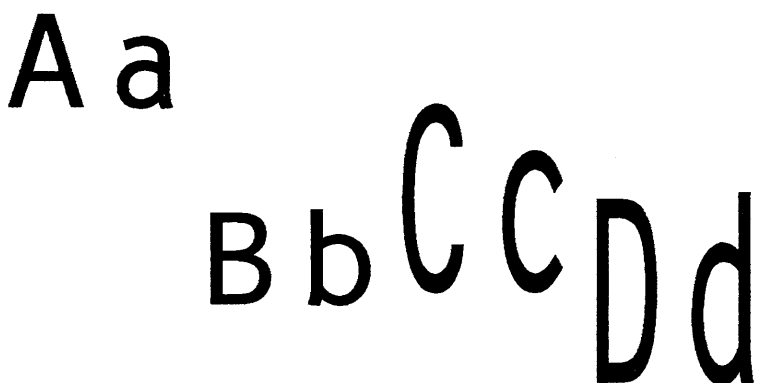
Comments

The **J** command is input as part of the data in one of the alphanumeric commands and only affects the justification; other parameters (such as height and width) are not changed.

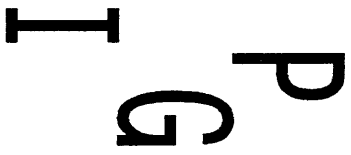
A justification of 2 inches specifies a print position 2 inches down from the position of the alphanumerics command; a subsequent justification of 1 specifies the print position at 1 inch down from the position of the alphanumerics command.

Example The following sample commands illustrate character justification changes in normal resolution. (The Graphics Mode Enable command was previously sent to enable Graphics Mode but is not shown in the examples.)

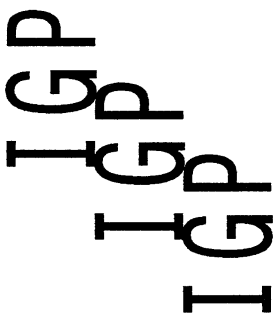
```
^M05,05,000Aa^J105Bb^M10,05,050Cc^J100Dd^-
```




```
^V05,05,000I^J050G^J025P^-
```




```
^E05,05,000IGP^J050IGP^J100IGP^-
```



```
^U03,05,000DOWN^J100SIDE^J050UP^-
```

Line Feed

Purpose Performs a line feed (hex 0A) and a carriage return function when used to terminate a standard graphics command.

Mode Graphics with a Standard Graphics Command selected

Format (cc)*

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
*	The graphics LF mnemonic. Enter *.

Comments

The line feed command functions as a carriage return only when it is used to terminate a graphics sequence in an extended graphics command when Free Format is enabled.

Line Slew

Purpose Changes the vertical print position by specifying a number of lines to advance the paper from the current print position.

Mode Graphics with a Standard Graphics Command selected

Format (cc) *slew n* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
slew	Represents a Line Slew command. Enter **K** or **W**. (Both **K** and **W** perform the same line slew command.)
n	Specifies the number of lines to advance (slew) at the current lines per inch (lpi) setting. Enter a two-digit number of lines ranging from **01** through **99**. For example, enter **05** to slew 5 lines, **21** to slew 21 lines.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Line Spacing

Purpose Selects a new line spacing in lines per inch (lpi).

Mode Graphics with a Standard Graphics Command selected

Format (cc) @ L *newlpi* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
@	Specifies one of the @ commands. Enter @ to begin an @ command function.
L	Specifies the Line Spacing command. Enter **L** to change the line spacing.
newlpi	Represents the line spacing parameter. Enter one of the two-digit codes shown in Table 13 to select a new line spacing. For example, enter **10** to select 10 lpi. Not all values are available on all printer models. Check with your printer *User's Manual* for the line spacing options available. Once the new line spacing is selected, all lines are printed at the new lpi setting until another line spacing is selected or VGL returns to the Normal Mode.

(cc)- Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Table 13. Line Spacing Codes

Line Spacing Code	Line Spacing (lpi) Selected
01	1
02	2
03	3
04	4
06	6
07	6
08	8
09	9
10	10
12	12
18	18
72	72

Values above 20 (except 72) default to 18. Values selected but not shown on the table are rounded to the nearest value. For example, selecting a line spacing code of 05, would be rounded up to 06.

Example The following example illustrates different line spacings.

```
^PY^-^F^-
Standard Characters in the Graphics Mode^*
at the standard line spacing^*
of 6 lines per inch.^*
^@L08^-Standard characters in the Graphics Mode^*
at the new line spacing^*
of 8 lines per inch.^*
^@L06^-
^O^-^PN^-
```

```
Standard Characters in the Graphics Mode
at the standard line spacing
of 6 lines per inch.
Standard characters in the Graphics Mode
at the new line spacing
of 8 lines per inch.
```

Lines, Dashed

Purpose Produces dashed lines.

Mode Graphics with an Extended Graphics Command selected

Format (cc) LD *horz vert* (cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

LD The Dashed Line command. Enter **LD**.

horz

Normal Resolution:
Defines the horizontal length of the line in tenth inches and dot columns. Enter a three-digit horizontal length value ranging from **000** through **999** to define a horizontal length of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot columns of length. VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot columns. The additional dots are only printed if the length is an even number. If the length is an odd number, the space for the additional dots is provided but the dots are not printed. For example, entering 0126 specifies a 1.2-inch plus 6-dot column horizontal line length; entering 1016 specifies a 10.1-inch plus 6-dot column horizontal line length, but the additional 6 dots are not printed. The **LD** command is ignored if either length parameter is zero plus zero dots.

High Resolution:
Defines the horizontal length of a line in thousandth inches. Enter a five-digit horizontal value ranging from **00000** through **99999** to define a horizontal length of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits.

vert

Normal Resolution:
Defines the vertical length of the line in tenth inches and dot rows. Enter a three-digit vertical length value ranging from **000** through **999** to define a vertical length of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot rows of length. VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot rows. The additional dots are only printed if the length is an even number.

If the length is an odd number, the space for the additional dots is provided but the dots are not printed. For example, entering 0004 specifies a 0.0-inch plus 4-dot row vertical line length; entering 0242 specifies a 2.4-inch plus 2-dot row vertical line length, but the additional 2 dots are not printed. The LD command is ignored if either length parameter is zero plus zero dots.

High Resolution:
Defines the vertical length of a line in thousandth inches. Enter a five-digit vertical value ranging from **00000** through **99999** to define a vertical length of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits.

NOTE: Even in High Resolution Mode, dashed lines are still "dashed" in tenths-of-an-inch increments.

(cc)- Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

Line drawing commands are positioned by the parameters or commands of an alphanumerics command sequence (such as horizontal tabs, the justification parameter, etc.). Consequently, an alphanumeric command must precede a line drawing command.

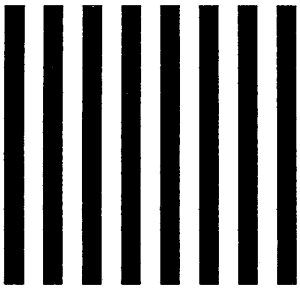
Using appropriate values for the horizontal and vertical line length parameters constructs a variety of vertical and horizontal lines in varying line thicknesses. The dashed line is produced by printing the odd tenth inches of length only; the even tenth inches of length are blanked. If the length ends in an even number (2.4" for example), the last even tenth inch is blank, making the line appear one-tenth inch too short. A 2.4" dashed line appears to be the same length as a 2.3" dashed line due to the blanking of the last even tenth inch.

The vertical or horizontal orientation of the dashed line is determined by the horizontal and vertical length parameters. If the horizontal length parameter is the longest, a dashed horizontal line is printed; conversely, if the vertical length parameter is the longest, a dashed vertical line is printed. If the horizontal and vertical line length parameters are equal, VGL prints a horizontal dashed line.

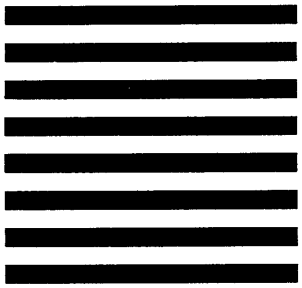
Examples The following examples illustrate dashed lines in normal resolution mode. Note that changing the horizontal and vertical line length parameter values constructs a variety of dashed vertical and horizontal lines in varying line thicknesses. With horizontal lines, the horizontal length parameter actually specifies line length and the vertical length parameter determines line thickness. Similarly with vertical lines, the vertical length parameter specifies line length and the horizontal length parameter determines line thickness. Notice that an alphanumerics command is required for line positioning.

```
^PY^-
^M01,01,000^LD0200,0010^LD0200,0001^-
^PN^-
```

```
^PY^-
^M01,01,000^LD0150,0150^-
^PN^-
```



```
^PY^-
^M01,01,000^LD0150,0154^-
^PN^-
```



Lines, Solid

Purpose Produces solid lines.

Mode Graphics with an Extended Graphics Command selected

Format (cc) LS *horz vert* (cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

LS The Solid Line command. Enter **LS**.

horz Normal Resolution:
Defines the horizontal line length in tenth inches and dot columns. Enter a three-digit horizontal length value ranging from **000** through **999** to define a horizontal length of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot columns of length.

VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot columns.

For example, entering 0120 specifies a 1.2-inch plus no-dot column horizontal line length; entering 1016 specifies a 10.1-inch plus 6-dot column horizontal line length. This command is ignored if either length parameter is zero plus zero dots.

High Resolution:
Defines the horizontal length of a line in thousandth inches. Enter a five-digit horizontal value ranging from **00000** through **99999** to define a horizontal length of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits.

vert Normal Resolution:
Defines the vertical length of the line in tenth inches and dot rows. Enter a three-digit vertical length value ranging from **000** through **999** to define a vertical length of 00.0 through 99.9 inches and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot rows of length.

VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot rows.

For example, entering 0004 specifies a 0.0-inch plus 4-dot row vertical line length; entering 0240 specifies a 2.4-inch plus no-dot row vertical line length. This command is ignored if either length parameter is zero plus zero dots.

High Resolution:
Defines the vertical length of a line in thousandth inches. Enter a five-digit vertical value ranging from **00000** through **99999** to define a vertical length of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits.

(cc)- Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

Line drawing commands are positioned by the parameters or commands of an alphanumerics command sequence (such as horizontal tabs, the justification parameter, etc.). Consequently, an alphanumerics command must precede a line drawing command.

Using appropriate values for the horizontal and vertical line length parameters constructs a variety of vertical and horizontal lines in varying line thicknesses. The horizontal or vertical orientation of the line is determined by the longest length parameter.

Example The following commands illustrate solid lines in normal resolution. As shown in the examples, changing the horizontal and vertical line length parameter values constructs a variety of vertical and horizontal lines in varying line thicknesses.

With horizontal lines, the horizontal length parameter actually specifies line length and the vertical length parameter determines line thickness.

Similarly with vertical lines, the vertical length parameter specifies line length and the horizontal length parameter determines line thickness. (The Graphics Mode Enable command was previously sent to enable Graphics Mode but is not shown in the examples. Additionally, an alphanumerics command must be sent for line positioning but is not shown in the examples.)

```
^LS0425,0010^-
```

```
^LS0100,0100^-
```

```
^LS0001,0150^-
```


Logo Generation (Version II)

Purpose Provides eight pre-designed logos and symbols in different sizes and rotations totaling 14 new options. Logo Generation is used in conjunction with the Pixel Expansion command described on page 125

Mode Graphics with an Extended Graphics Command selected

Format (cc) ILOGO, *value* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
ILOGO,	The Logo Generation command. Enter **ILOGO,** (the comma following the command is required).
value	Represents the variable which selects the predefined logo or symbol. Enter a 2-digit value from Table 14 representing the symbol or logo desired.
(cc)G	The required terminator for the **ILOGO,** command. Enter the SFCC for your VGL configuration followed by a **G** to end the **ILOGO,** command sequence.

Table 14. Logo Generation Values

Value	Description
41	Copyright symbol
42	Copyright symbol at 90 degrees
43	Registered trademark symbol
44	Registered trademark symbol at 90 degrees
45	UL symbol, large
46	UL symbol, large, at 90 degrees
47	Trademark symbol
48	Trademark symbol at 90 degrees
49	CSA symbol
4A	CSA symbol at 90 degrees
4B	UL symbol, medium
4C	UL symbol, small
61	TUV Rheinland symbol
62	GS-Mark symbol

Comments

The Pixel Expansion (IPEXP) command, described on page 125, may be used with all logos printed using the **ILOGO,** command.

Logos and symbols created using the **Z** command (described on page 150) are still available and do not conflict with the **ILOGO,** command. Do not use any alphanumeric-rotation commands with **ILOGO,** symbols and logos.

Example The following program and print sample illustrate how the copyright symbol (value 41 from Table 14) is called using the **ILOGO,** command. Note that the alphanumerics command ^M is simply “introducing” an Extended Graphics command; therefore, the alphanumeric command parameters (01,01,000) are optional.

```
^PY^-
^M^IPEXP,06,06^G^ILOGO,41^G^-
^PN^-
```

Logo, PCX

Purpose Downloads and prints PCX format logos.

Mode Standard Graphics format except for option E (see below).

Format

Format 1	(cc) IPCX, *option name* [,*size*] [,DISK] (cc)G *PCX logo data* (cc) IPCX, END(cc)G
Format 2	(cc) IPCX, *option name* [,DISK] (cc)G
Format 3	(cc) IPCX, *option* (cc)G
(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
IPCX,	The Logo Generation command. Enter **IPCX,** (the comma following the command is required).
option	**C** = Creates/Loads logo into printer memory. The logo can be printed later. **E** = Executes/Prints logo. **D** = Deletes logo from printer memory. **R** = Resets/Clears logo from printer memory. **L** = Lists all the PCX logos that are stored in printer memory.
name	Name of logo. Required for options C, E, and D.
size	Size (in bytes) of the logo.
DISK	Optional parameter to download a logo to flash memory or execute (print) a logo stored in flash memory. Enter **DISK**. Currently, the DISK parameter only applies to option C and option E.
(cc)G	The required terminator for the **IPCX,** command. Enter the SFCC for your VGL configuration followed by a **G** to end the **IPCX,** command sequence.
PCX logo data	Logo data in PCX format. Must be in either uncompressed or packbits format.
END	Ends PCX logo to be downloaded.

NOTE: Format 1 is used for creating/downloading a logo (option C).

Format 2 is used for executing (printing) a logo (option E), or deleting a logo from memory (option D).

Format 3 is used for listing (option L) or clearing (option R) all logos from memory.

NOTE: Option E (executing/printing a logo) should be used in Graphics mode with Extended Graphics Command selected. All other options should be used in Standard Graphics mode.

Example To download a PCX logo:

^IPCX,C*filename*[,*size*]^G
PCX logo data
^IPCX,END^G

Your host may interpret the PCX data as control codes, which affects the way the host sends data to the printer. Consult your host's user manual for sending binary data.

To print a PCX logo in Extended Graphics mode:

^IPCX,E*filename*^G

Logo, TIFF

Purpose Downloads and prints TIFF format logos.

Mode Standard Graphics format except for option E (see below).

Format

Format 1	(cc) ITIFF, *option name* [,*size*] [,DISK] (cc)G *TIFF logo data* (cc) ITIFF, END(cc)G
Format 2	(cc) ITIFF, *option name* [,DISK] (cc)G
Format 3	(cc) ITIFF, *option* (cc)G
(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
ITIFF,	The Logo Generation command. Enter **ITIFF,** (the comma following the command is required).
option	**C** = Creates/Loads logo into printer memory. The logo can be printed later. **E** = Executes/Prints logo. **D** = Deletes logo from printer memory. **R** = Resets/Clears logo from printer memory. **L** = Lists all the TIFF logos that are stored in printer memory.
name	Name of logo. Required for options C, E, and D.
size	Size (in bytes) of the logo.
DISK	Optional parameter to download a logo to flash memory or execute (print) a logo stored in flash memory. Enter **DISK**. Currently, the DISK parameter only applies to option C and option E.
(cc)G	The required terminator for the **ITIFF,** command. Enter the SFCC for your VGL configuration followed by a **G** to end the **ITIFF,** command sequence.
TIFF logo data	Logo data in TIFF format. Must be in either uncompressed or packbits format.

END Ends Tiff logo to be downloaded.

NOTE: Format 1 is used for creating/downloading a logo (option C).

Format 2 is used for executing (printing) a logo (option E), or deleting a logo from memory (option D).

Format 3 is used for listing (option L) or clearing (option R) all logos from memory.

NOTE: Option E (executing/printing a logo) should be used in Graphics mode with Extended Graphics Command selected. All other options should be used in Standard Graphics mode.

Example To download a TIFF logo:

```
^ITIFF,Cfilename[,size]^G
TIFF logo data
^ITIFF,END^G
```

Your host may interpret the TIFF data as control codes, which affects the way the host sends data to the printer. Consult your host's user manual for sending binary data.

To print a TIFF logo in Extended Graphics mode:

```
^ITIFF,Efilename^G
```

Page, Controlling Paper Options (Version II)

NOTE: This command is partially supported on L7032 printers. The L7032 printer supports only EJECT, COPY, ORIENTATION, and MARGINS.

Purpose Controls the paper options for printing.

NOTE: Not all options may be available with your printer. Consult your printer *User's Manual* to determine which options are available. If an option is not available, the emulation ignores the corresponding command.

Mode Graphics with a Standard Graphics Command selected

Format (cc) IPAGE, *option* [,*value*] (cc)G (cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IPAGE, The command to control paper options. Enter **IPAGE,** (the comma following the command is required).

option [,*value*] Represents the option to be set. See Table 15. Enter the option and comma, then the value.

(cc)G Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator.

(cc)- Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Table 15. Page, Controlling Paper Options

Option	Value and Meaning
SPEED, (Thermal only)	Specifies the print speed in lines per minute at 6 lpi. Enter **SPEED** and a number in the range of **0** through **9999**.
INTENSITY, (Thermal only)	Specifies the darkness of the dots. Enter **INTENSITY** and a number in the range of -**15** through +**15**.
TEAR, (Thermal only)	Sets the printer to pause (for the user to tear-off a page) after a specified number of pages. Enter **TEAR** and a number in the range of **0** through **256** (0 implies no pause).
CUT,	Sets the printer to cut a page after a specified number of pages. Enter **CUT** and a number in the range of **0** through **256** (0 implies no cutting). **Note**: This does not perform a job separation. Use the **EJECT** command for job separations.
LABELS, (Thermal)	Specifies the label sensor. Enter **LABELS** and a number in the range from **0** through **7** (0 is disable). 0 = No sensor 1 = Reflective gap sensor, 2 = Transmissive gap sensor.
EJECT,	Tells the printer to eject a partially-complete page from the printer, regardless of the current graphical print position. Enter **EJECT**. (No values follow the command.) On continuous form printers, **EJECT** moves enough paper so that all completed or partially completed pages are fused and moved completely out of the engine.
COPY,	Sets the printer to print multiple copies of each "physical page" - that is, one cut sheet or the distance between perforations on continuous forms, which may contain multiple forms or labels. (If the page contains incremented fields for a repeated form, the image is the same.) Enter **COPY** followed by the number of copies from **001** through **999**. (If a partial page has not been printed and an **EJECT** is performed, then the selected number of copies of the partial page is produced.)
ORIENTATION,	Sets printing orientation. After the **IPAGE** command, enter either **PORT** for portrait, **LAND** or **RLAND** for landscape, **INV** for inverted portrait, or **LLAND** for inverted landscape. If any data has been drawn on a page when this command is received with a new orientation, the current physical page is printed and the next page is in the new orientation. (Existing margin settings apply to the new orientation.)
MARGINS,	Sets the page margins and printable text length. Enter **MARGIN** followed by four digits specifying the top margin in hundredths of an inch (0000/0.00 - 9999/99.99), three digits specifying the text length in character lines at the current line spacing (001-999), and four digits specifying the left margin in hundredths of an inch (0000/0.00 - 9999/99.99). (See Appendix D for an explanation of page margins.)

Passing Hex Values

Purpose Sends specified hex values to the printer. This command can be used in Standard or Extended Graphics mode.

Mode Standard or Extended Graphics mode, with or without an Extended Graphic Command selected

Format (cc) IHEX, *value*

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IHEX, The Pass Hex Values command. Enter **IHEX,**. (The comma following the command is required).

value The hex value to be sent to the printer. Valid values are hex **00** through **FF**.

Comments

The IHEX command can be used to send graphic and non-graphic hex data. The difference between the use of the command is shown in example 1, Standard Graphic mode, and Example 2, Extended Graphic mode.

Example 1

The following example of the command used in the Standard Graphic mode, prints A through F with C underlined. The hex 08 is the control code for a backspace.

NOTE: The "Control Code 08" setting for the Line Printer Plus Emulation must be set to "Backspace" in order for VGL to recognize the hex code. Refer to your *User's Manual* for details.

```
^PY^-
ABC^IHEX,08_DEF
^PN^-
```

Example 2 The following example of the command used in the Extended Graphic mode, prints Schön with the proper accent marks.

```
^PY^-^F^
^M0202000Sch^IHEX,F6n^-
^O^-^PN^-
```

Schön

Pixel Expansion (Version II)

Purpose Expands those graphics which were plotted using the **ILOGO,** command (page 118), the Plotting Graphics (cc)Q command (page 129), and the Symbols command (page 145).

Mode Graphics with an Extended Graphic Command selected

Format cc) IPEXP, *horz, vert* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
IPEXP,	The Pixel Expansion command. Enter **IPEXP,** (the comma following the command is required).
horz	The horizontal expansion of the logo or symbol. Enter a value ranging from **1** through **255**. Leading zeros for values less than three digits are not required.
vert	The vertical expansion of the logo or symbol. Enter a value ranging from **1** through **255**. Leading zeros for values less than three digits are not required.
(cc)G	The required terminator for the **IPEXP,** command. Enter the SFCC for your VGL configuration followed by a **G** to end the **IPEXP,** command sequence.

Comments

Only use the **IPEXP,** command in conjunction with graphics plotting and symbols which were created using the **ILOGO,** command, the Plotting Graphics **Q** command, and the Symbols command. The **IPEXP,** command expands these pre-designed graphics and symbols similar to the way normal characters are expanded using the Character Height and Character Width commands.

The **IPEXP,** command does not affect any other elements, such as fonts. Unless this command is turned off, once an expansion factor is selected, that value remains selected until a new **IPEXP,** command is received. Turn this command off by entering 1,1 for the horizontal and vertical expansion values.

Example The following program and print sample illustrate how the TUV Rheinland symbol (value 61 from Table 14) is called using the **ILOGO,** command and expanded 4X by 4X using the **IPEXP,** command. Note that the alphanumerics command ^M is simply “introducing” an Extended Graphics command; therefore, the alphanumeric command parameters (such as 01,01,000) are optional.

```
^PY^-^F^-
^M^IPEXP,04,04^G^ILOGO,61^G^-
^PN^-
```

Plotting Bitmap Images

Purpose Creates and prints bitmap images

Mode Graphics with an Extended Graphics Command selected

Format To create a bitmap image:

(cc) IPLOT, *type, id, width, data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IPLOT, The bitmap image command. Enter **IPLOT,** (the comma is required).

type The data type that is used to specify the bitmap. Enter **4** for 4 bit data, or **8** for 8 bit data. For 4 bit data, two bytes determine 8 bits of the image. For 8 bit data, one byte determines 8 bits of the image.

id The bitmap identification number. Enter a one digit number between **0** and **9**.

width The width of the bitmap, in bytes. Enter a value between **1** and **999**. Leading zeros for values with less than 3 digits are not required.

data The bitmap image data. The data may either be specified in its entirety, or represented in a compressed format using the (cc)B, (cc)W, and (cc)D commands in any sequence and quantity.

(cc)B *pattern*, *count*
Byte repeat specifier. Allows you to repeat a desired byte pattern. Enter the SFCC, followed by **B**. Then enter a 2 character byte pattern, followed by a comma, followed by a value between **1** and **999** for the number of times (count) to repeat the pattern. Leading zeros for values with less than 3 digits are not required.

(cc)W *count* "White" byte (all bits "off") repetition. Enter the SFCC, followed by **W**, followed by a value between **1** and **999** for the number of times (count) to repeat the pattern. Leading zeros for values with less than 3 digits are not required.

(cc)D *count* "Dark" byte (all bits "on") repetition. Enter the SFCC, followed by **D** followed by a value between **1** and **999** for the number of times (count) to repeat the pattern. Leading zeros for values with less than 3 digits are not required.

(cc)G IPLOT command terminator. Enter the SFCC for your VGL configuration followed by **G** to end the IPLOT command sequence.

To print a previously created bitmap image:

(cc) IPLOT,E, *id* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
IPLOT,E,	The bitmap image execute (print) command. Enter **IPLOT,E,** (both commas are required).
id	The bitmap identification number. Enter a one digit number between **0** and **9**. The number must correspond to the identification number used for a previously created bitmap, or an error is reported.
(cc)G	IPLOT command terminator. Enter the SFCC for your VGL configuration followed by **G** to end the IPLOT command sequence.

Comments

Bitmap images are stored in memory only as long as the printer power is applied, or until being replaced by another bitmap with the same identification number. The maximum size and number of bitmaps that may be created is dependent on the amount of available printer memory. Therefore, it may not be possible to store up to the maximum number of 10 bitmap images if each is relatively large.

Bitmap images may be created using the **IPLOT,** command as a standard graphics command once graphics mode has been enabled. However, the **IPLOT,E,** command must be used as an extended graphics command within a graphics (^M, ^V, ^E, ^U, ^T, ^J) command sequence to position and rotate the bitmap as desired.

Example The bit pattern 11000011 is represented by the hex characters C3. To specify 10 consecutive C3 patterns, you can enter either C3C3C3C3C3C3C3C3C3C3 or, using the byte repeat format, (cc)BC3,10. Also, for clarity, commas may be embedded within the data stream, such as C3,C3,C3,C3,C3,C3,C3,C3,C3,C3 or C3C3,C3C3,C3C3,C3C3,C3C3.

A stream of 6 consecutive 00 bytes may be written 00,00,00,00,00,00 or, using the "white" byte repetition format, (cc)W6.

A stream of 9 consecutive FF bytes may be written FFFFFFFFFFFFFFFFF or, using the "dark" byte repetition format, (cc)D9.

The following illustrates how to create and print a simple bitmap image. The bitmap is created using 4 bit data, is identified as bitmap number 0, and is 120 bytes wide. On a 300 dpi printer, this creates an image that is 3 inches wide (120 bytes*8 bits per byte = 900 bits, or 900 dots, or 3 inches wide).

```
^PY^-
^F^-
^IPLOT,4,0,120,
^D40,^W40,^D40,^D40,^W40,^D40,
^D40,^W40,^D40,^D40,^W40,^D40,
^D40,^W40,^D40,^D40,^W40,^D40,
^D40,^W40,^D40,^D40,^W40,^D40,
^D40,^W40,^D40,^D40,^W40,^D40,
^D40,^W40,^D40,^D40,^W40,^D40,
^G^-
^O^-
^PN^-
```

The following prints the bitmap:

```
^PY^-
^M0101000^IPLOT,E,0^G^-
^,
^PN^-
```

The resulting image:

Plotting Graphics (Columns)

Purpose Creates logos or other graphic patterns by plotting in dot-addressable columns.

NOTE: Do not confuse this graphics plot command, **(cc)Q**, with the odd dot plot command, **(cc)Q**, discussed on page 132. The graphics plot command discussed in this section plots in *vertical* data bytes (columns) and is effective when an Extended Graphics Command is selected. Odd dot plot plots in *horizontal* data bytes (rows) and is effective when a Standard Graphics Command is selected.

Mode Graphics with an Extended Graphics Command selected

Format (cc) Q *data* (cc) G (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
Q	The Logo command. Enter **Q**.
data	The hexadecimal logo data. Each hexadecimal value defines one 7-dot vertical data byte (column) for each 0.1-inch row.
(cc)G	Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, to end the input of logo data.

(cc)- Graphics Mode CR used as a sequence terminator. Enter the SFCC for your configuration immediately followed by **-** to end the command sequence.

Comments

Logos are positioned by the parameters or commands of an alphanumerics command sequence (such as horizontal tabs, the justification parameter, etc.) and can be created only from within an alphanumerics command sequence. Consequently, an alphanumerics command must precede a Logo command.

Any logo that can be designed using the rows of the 0.1-inch x 0.1-inch matrix grid can be produced with the **Q** command. The form example in the “Exercises And Examples” chapter on page 301, illustrates how the hand logo was produced. An arrow pattern is illustrated in the following example.

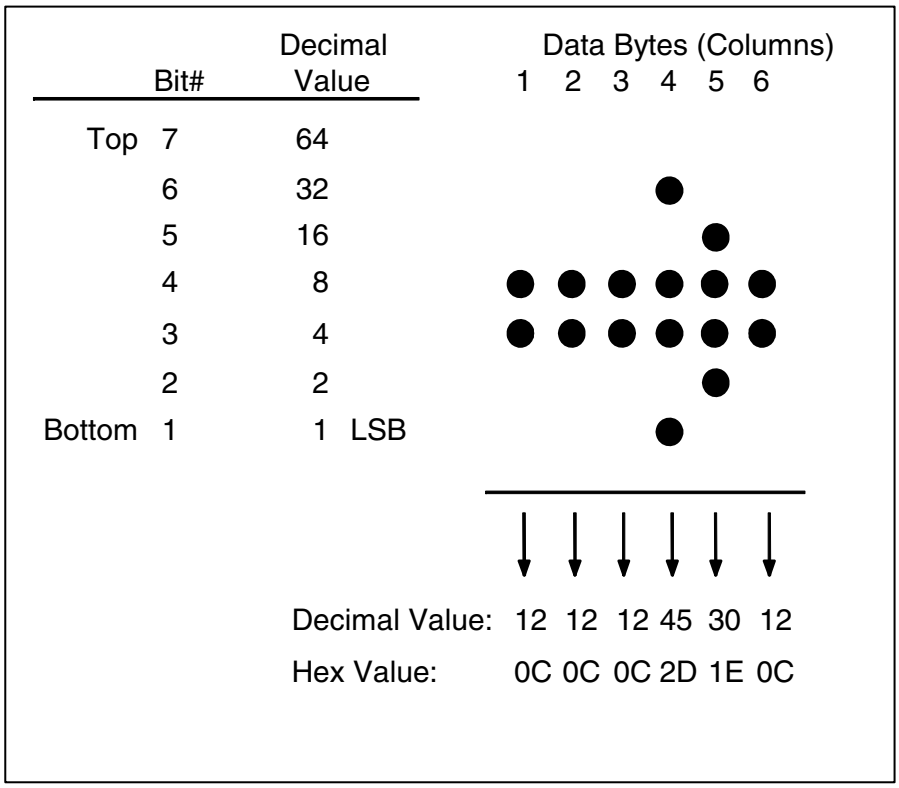
Graphics designed using this command cannot be stored in VGL memory for future use. Once your graphic pattern prints, it is automatically purged from VGL working memory.

Example 1

The bottom-most bit of the data byte corresponds to the least significant bit (LSB) of the data byte, which corresponds to the bottom row (row #1); the data byte works up through the other bits to the top-most significant bit of the data byte, which corresponds to the top bit row (row #7).

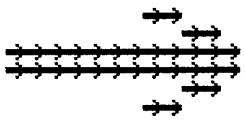
Summing the values determines the data for each column of the logo. Table 16 shows the decimal value sums for each data byte (column) for the arrow pattern illustrated. Each byte was calculated first in decimal and then converted to the equivalent hexadecimal value (using the ASCII chart in Appendix A). These hexadecimal values are then entered in the *data* parameter for the Q command.

Table 16. Graphics Logo Plot Data Format



Example 2 The sample command below illustrates the logo function drawing the arrow shown in Table 16. The six hex data values for each 0.1" x 0.1" matrix are repeated and horizontal tabs and justification commands are used to produce the arrow in an arrow pattern. Notice that an alphanumerics command was required for logo positioning.

```
^PY^-^F^-
^M01,01,000^T0070^Q0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C^G^-
^M01,01,000^T0090^Q0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C^G^-
^M01,01,000^Q0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,
1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,
0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,
1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C^G^-
^M01,01,000^Q0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,
1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,
0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,
1E,0C,0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C^G^-
^M01,01,000^T0090^Q0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C^G^-
^M01,01,000^T0070^Q0C,0C,0C,2D,1E,0C,0C,0C,0C,2D,1E,0C^G^-
^O^-^PN^-
```



Plotting Graphics (Rows)

NOTE: The Plotting Graphics command is not supported on L7032 printers.

Purpose Allows you to address and print any individual dot position using Printronix odd and even dot plot commands. Odd and even dot plot addresses each dot position using a row method (as opposed to the column method created in Extended Graphics as described on page 129.)

NOTE: Do not confuse this odd dot plot command, **(cc)Q**, with the graphics plot command, **(cc)Q**, discussed on page 129. The odd dot plot discussed in this section plots in *horizontal* data bytes (rows) and is effective when a Standard Graphics Command is selected. Graphics plot plots in *vertical* data bytes (columns) and is effective when an Extended Graphics Command is selected.

Mode Graphics with a Standard Graphics Command selected

Format (cc) *plot data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
plot	Represents a Printronix plot command. Enter **Q** for normal density odd dot plot, or enter **C** for high density even dot plot.
data	The plot data. Enter the hex data required to produce the desired graphics pattern. (See Comments below.)
(cc)G	Following the data, enter the (SFCC) for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Comments

Graphics designed using this command cannot be stored in VGL memory for future use. Once your graphic pattern prints, it is automatically purged from VGL working memory.

In typical Printronix plotting, the binary pattern ASCII characters supplied as data are used to address the character columns with the Least Significant Bit (LSB) corresponding to the left-most dot column. VGL, however, addresses the binary pattern of hex data bytes in a "mirror image" of Printronix plotting, with the LSB addressing the right-most dot position.

Two plot types are available and defined below: odd dot plot for normal density and even dot plot for high density applications. You must define each byte of each data line in plot format, which is explained in the "Plot Data Byte Format" section on the next page.

Odd dot plot (normal density plotting) is selected with the Odd Dot Plot command, (cc)**Q** *data* (cc)G. Odd dot plot addresses the

odd numbered dot columns to produce a horizontal and vertical density that varies based on the printer and mode of operation.

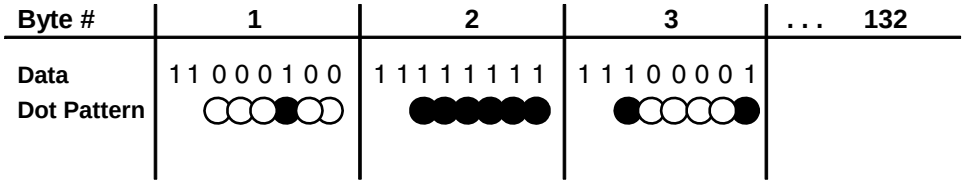
Even dot plot (high density plotting) is selected with the Even Dot Plot command, (cc)C *data* (cc)G. Even dot plot works in conjunction with the Odd Dot Plot command. The odd and even numbered dot columns are addressed to double the horizontal density.

Plot Data Format

You must define each byte for a complete line of data in plot format. Plot Data *Byte* Format explains how to define each byte along a data line. Plot Data *Line* Format explains how to take each defined byte and create a complete line of data.

Plot Data Byte Format

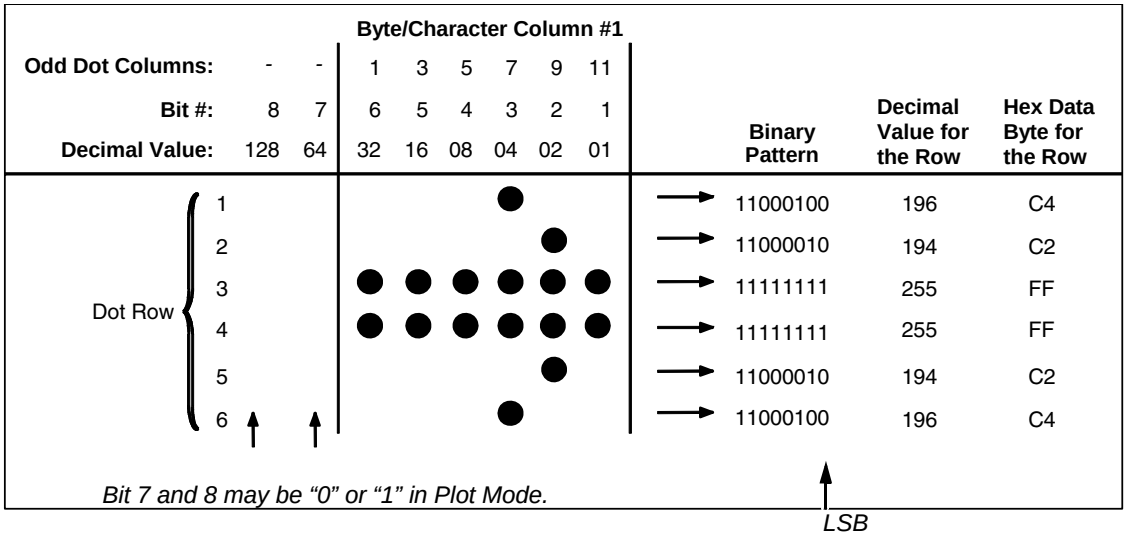
Each data byte specifies six of the twelve dot columns that compose one character column. Using odd dot plot, bits 1 through 6 of the data byte address the odd numbered dot columns; using even dot plot, bits 1 through 6 of the data byte address the even numbered dot columns.



A dot is printed for each bit that is set ("1") in the data byte. When using plot commands, bits 7 and 8 of the data byte must *always* be set "1". The sum of each bit in the data byte, in hexadecimal value, becomes the plot data used in the plot command.

For example, refer to Table 17. A hex data value of C4 prints a dot at the column corresponding to the 04 bit. A hex data byte value of FF produces dots in all columns; a value of C0 leaves the column blank. The bit pattern addresses the odd columns of the character space for odd dot plot or the even columns of the character space for even dot plot. Both odd and even columns are used for high density plot. These hex data bytes to produce the graphics pattern are entered in the data parameter of the plot command. Table 17 illustrates the plotting hex data required to produce the same arrow graphics as shown in Table 16 on page 131 for the Logo Mode.

Table 17. Odd Dot Plot Data Example



Plot Data Line Format

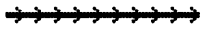
Each plotted line of data may include up to 132 data bytes. The first data byte in the line addresses the dot positions to print in the first character column; the second data byte addresses the dot positions to print in the second character column, etc. After the last byte of data, enter the terminator command (cc)G, and repeat this sequence for the number of plot lines involved.

In odd dot plot, the (cc)G terminator causes the contents of the buffer to plot and advances the paper (or moves the logical print position in thermal printers) a single dot row based on the vertical density of the current print mode. In even dot plot, the paper/logical print position is not advanced.

For high density plot, the Even Dot Plot and Odd Dot Plot commands are used in conjunction with two data lines. The Even Dot command is sent with the first data line along with the (cc)G terminator. The terminator causes the contents of the buffer to plot in the even dot columns but does *not* advance the paper/logical print position. The printer waits for the second line of data using the Odd Dot Plot command and a terminator. Data in the buffer is plotted in odd dot columns of the same row where even dot column data was just plotted and the paper/logical print position is advanced one dot row at the vertical density of the current print mode.

Example The following sample command illustrates Printronix plotting, plotting a line of arrows using the data shown in Table 17.

```
^PY^-^F^-
^QC4,C4,C4,C4,C4,C4,C4,C4,C4,C4^*
^QC2,C2,C2,C2,C2,C2,C2,C2,C2,C2^*
^QFF,FF,FF,FF,FF,FF,FF,FF,FF,FF^*
^QFF,FF,FF,FF,FF,FF,FF,FF,FF,FF^*
^QC2,C2,C2,C2,C2,C2,C2,C2,C2,C2^*
^QC4,C4,C4,C4,C4,C4,C4,C4,C4,C4^*
^O^-^PN^-
```



Reset

NOTE: The Reset command is not supported on L7032 printers.

Purpose Resets VGL to the current user defined configuration.

Mode Graphics with a Standard Graphics Command selected

Format (cc) @ R (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
@	Specifies one of the @ commands. Enter @ to begin an @ command function.
R	Specifies the Reset command. Enter **R** to reset the printer to the current user defined configuration.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The Reset command prints any pending page then resets VGL to the current user defined configuration (last loaded configuration plus any front panel changes). This may not be the same configuration used to power-up the printer if the front panel changes were made and not saved to flash memory. VGL then restarts as if just powered up (no dynamic forms in form library, character substitution sets reset, starts printing in upper left corner, etc.).

NOTE: Any EVFU setting in the Line Printer Plus Emulation (by direct codes or the VGL (cc)L command) is not reset (see page 89).

Reverse Print

Purpose Produces white characters on either a black printed background or any of the shaded or patterned backgrounds available with the shading and shading mask features.

Mode Graphics with an Extended Graphics Command selected

Format (cc) R *data* (cc)R (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
R	The Reverse Print command. Enter **R**.
data	The data characters for reverse printing.
(cc)R	Following the data, enter the SFCC for your VGL configuration and the Reverse Print command (**R**) to turn off the reverse printing feature.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your configuration immediately followed by **-** to end the command sequence.

Comments

The **R** command is input as part of the data in one of the alphanumeric commands. The **R** command must be turned on and off by command. Any character data entered between the reverse print on and off commands is printed in reverse print. However, when the alphanumerics command sequence is terminated, reverse printing is also terminated.

Shading (page 140) or shading mask (page 142) backgrounds are also available with the **R** command. Do not use Compressed Print Fonts (discussed on page 47) with this feature.

The reverse printed character is actually created by not printing within the black or shaded background. A dark box border is automatically produced around the reverse printed characters character. The black background border combined with the size of the character increases the total area of the character field. If the descending character printing feature is used with reverse print, the black background border area is increased to allow for the descending character space.

Example The following examples illustrate reverse printing command sequences. In the first example, notice that the alphanumerics command sequence terminator was also used to end reverse printing.

```
^PY^-
^M05,05,000IGP^RIGP^-
^PN^-
```

```
^PY^-
^U05,05,000DOWN^RSIDE^RUP^-
^PN^-
```

IMPACT Scaling

Purpose Selects a new line spacing and different horizontal by vertical (H x V) dot density from the standard 120 x 72 base density. (See Comments below.)

Mode Graphics with a Standard Graphics Command selected

Format (cc) @ M *scale* 00 (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the SFCC for your configuration.
@	Specifies one of the @ commands. Enter @ to begin an @ command function.
M	Specifies the Scaling command. Enter **M** to change the horizontal and vertical scaling.
scale	Represents the scaling parameter. Enter one of the two-digit codes shown in Table 18 to select a new scaling. For example, with an MVP printer, enter **02** to select mode 2, 120 x 72 (H x V) dpi scale. Once the new scaling is selected, all printing reflects the new scale in horizontal by vertical dots per inch (dpi) until scaling is disabled or VGL returns to the Normal Mode.
00	Toggles scaling on and off. When **00** is first entered, the scaling value as selected in the *scale* parameter is enabled if a printer is selected through the “Prt to Emulate” option. When 00 is entered again, scaling is disabled and VGL returns to the default scaling configuration.
(cc)-	Graphics Mode CR. Enter the SFCC for your configuration followed by **-** to end the command sequence.

NOTE: If the VGL Options “Prt to Emulate” is selected, scaling is enabled.

Comments Dot density varies by printer mode; selecting a different printer mode selects a different horizontal and vertical dot density. This varying density can affect graphic elements created in one particular mode but printed in a different mode. Scaling permits graphic elements, such as corners or boxes, to retain their physical shapes and sizes when printed in a horizontal and vertical density other than the base density of 120 x 72 dpi.

Table 18. Scaling Codes

Printer Type	Scale Code	Printer Mode	Dot Density (H x V) dpi
MVP and MVP 150B	00	Toggles Scaling On/Off	
	01	1	200 x 96
	02	2	120 x 72
	03	3	125 x 64
	04	4	100 x 48
	05	5	200 x 72
L150	00	Toggles Scaling On/Off	
	01	1	200 x 96
	02	2	120 x 72
	03	3	125 x 64
	04	4	145 x 72
	05	5	160 x 72
P3040	00	Toggles Scaling On/Off	
	01	1	180 x 96
	02	2	120 x 72
	03	3	120 x 48
	04	4	145 x 72
	05	5	160 x 72
P6000	00	Toggles Scaling On/Off	
	01	1	120 x 144
	02	2	120 x 72
	03	3	120 x 48
P9000	00	Toggles Scaling On/Off	
	01	1	180 x 96
	02	2	120 x 72
	03	3	120 x 48

NOTE: MVP and MVP 150B printers must be in Scale Mode 02 and Printer Mode 2 to produce readable barcodes. L150 printers must be in Scale Mode 04 and Printer Mode 4 to produce readable barcodes, except for UPC-A, EAN 8 and EAN 13, which require Mode 5 to produce readable barcodes.

Shading

Purpose Produces alphanumeric characters using a black-shaded impression.

Mode Graphics with an Extended Graphics Command selected

Format (cc) KH *data* (cc)KH (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
KH	The Shading command. Enter **KH** to turn on the shading feature.
data	The data characters to print in shaded graphics.
(cc)KH	Following the data, enter the Special Function Control Code (SFCC) for your VGL configuration and **KH** to turn off the shading feature.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The **KH** feature must be turned on and off by command. Any character data entered between the **KH** on and off commands is shaded when printed. Shading commands are input as part of the data in one of the alphanumeric commands. Reverse printing (discussed on page 136) can be combined with shading.

When the shading feature is used, only certain dot positions are printed (versus every dot position in the normal graphics) which produces the shaded images. The shading value can be changed using the Shading Mask command discussed on page 142.

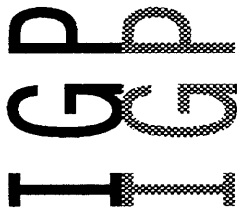
Examples The following sample commands illustrate shading.

```
^PY^-
^M05,05,000AaBb^KHCcDd^KH^-
^PN^-
```

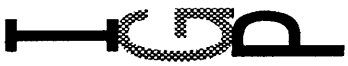
```
^PY^-
^M05,03,000IGP SH^KHAD^KHING^-
^PN^-
```

IGP SHADING

```
^PY^-
^E05,05,000IGP^KHIGP^KH^-
^PN^-
```



```
^PY^-
^E05,05,000I^KHG^KHP^-
^PN^-
```



```
^PY^-
^U03,03,000SHADING^KHDOWN^KHUPSIDE^-
^PN^-
```

UPSIDE-DOWNSHADING

Shading Mask

Purpose Activates the shading feature with a specific shading mask.

Mode Graphics with an Extended Graphics Command selected

Format (cc) KL *mask data* (cc)KH (cc)-

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

KL The Shading Mask command. Enter **KL** to turn on the shading mask feature.

mask Represents the shading mask factor. Enter a two-digit hex value ranging from **00** through **FF** to specify the shading mask factor. Four default shading mask patterns are available and shown below. See Appendix B for print samples of all masking values.

Mask Value (Hex)	Default Shading Mask Produced
00								
01	///////
04	\\\\\
FF	

The shading mask selected remains selected until another mask value is selected or the Shading Mask command is turned off.

data The data characters to print in mask shaded graphics.

(cc)KH Following the data, enter the Special Function Control Code (SFCC) for your VGL configuration and **KH** to turn off the shading mask feature.

(cc)- Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The **KL** command is used as part of the data contained in one of the alphanumeric commands.

Shading Mask commands must be turned on and off by command. Any character data entered between the **KL** on and off commands is shaded with the selected mask. Shading must be turned off before any commands are used to change character height, width, justification, or horizontal print position. Reverse printing can be combined with shading.

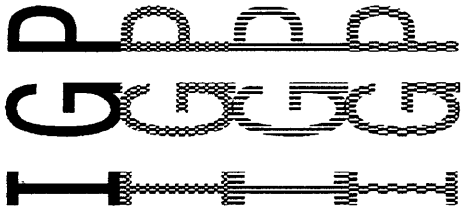
Examples The following sample commands illustrate shading. Four default mask shading factors are available to produce vertical stripes (KL00), horizontal stripes (KLFF), slanted stripes upper right to lower left (KL01), and slanted stripes upper left to lower right (KL04).

```
^PY^-
^M03,03,000IGP^KL00IGP^KLFFIGP^KL01IGP^KL04IGP^-
^PN^-
```

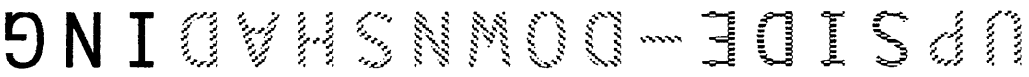
```
^PY^-
^M03,03,000IGP^KL00MASK^KL8DSHAD^KL02ING^-
^PN^-
```

```
^PY^-
^V05,05,000I^KLC2G^KHP^-
^PN^-
```

```
^PY^-
^E05,05,000IGP^KL9BIGP^KLFFIGP^KLF1IGP^KH^-
^PN^-
```



```
^PY^-
^U03,03,000ING^KL01SHAD^KL04DOWN-^KL8CSIDE^KL02UP^KH^-
^PN^-
```



Special Function Control Code Change

Purpose Changes the current Special Function Control Code (SFCC).

Mode Graphics with a Standard Graphics Command selected

Format (cc) N *x* (cc)-

(cc)	Represents the current Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
N	Specifies the SFCC Change command. Enter **N**.
x	Represents the new SFCC. Enter the ASCII character for the new SFCC. You can set the SFCC to any character from **17** through **255**.
(cc)-	A Graphics Mode CR using the new SFCC. Enter the new SFCC, immediately followed by **-** to end the command sequence.

Comments

You can also change the SFCC through configuration as described in your *User's Manual*.

When the SFCC is changed by the **N** command, the change is effective immediately, and the old SFCC is no longer recognized. When printer power is turned off and on, the SFCC returns to the configuration default.

Example The following command changes the SFCC from the caret (^) to the tilde (~).

```
^N~~-
```

Symbols, Creating Standard User Defined

Purpose To create specialized standard size symbols.

Mode Graphics with an Extended Graphics Command selected

Format (cc) z *x data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
z	The Create Symbol command. Enter lowercase **z**.
x	Represents the symbol being defined. See the Comments below and Table 19. Enter a lowercase character from **a** through **g** to specify where your symbol is stored. (Make a note of the corresponding “Print” Value; you need this number in your Print Symbols command when you print the symbol as discussed on page 150.)
data	The data required to define the symbol. Each dot row of a standard size symbol contains three character cells comprised of four dot rows each, which equals a total of 12 dots per row. Since the standard size symbol can only be 12 dot rows by 12 dot columns, the maximum number of character cells used to define a standard size symbol is 36 (12 dot rows X 3 character cells per row). ASCII characters from hex **0** through **F** are used to describe the dot pattern for each cell of the symbol. Enter hex values from 0 through F from Table 20 to describe the dot pattern. If more than 36 character cells are input, the extra data is ignored until a valid terminator, such as (cc)G, (cc)-, or (cc)* is found.
(cc)G	Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command.

Comments

The **z*x*** command creates a special standard sized symbol. When you are ready to print that symbol, use the **Z** command as described on page 150.

The **z*x*** command must be within a valid graphics sequence. The symbol can measure up to 12 dot rows wide by 12 dot columns high, based on 60 x 72 dots per inch resolution. You can create and store up to seven standard size symbols in printer memory. The created symbols remain in memory until they are redefined, the printer is reset, or the printer power is turned off.

Table 19. Standard Size Symbol Values

"Create" Value	"Print" Value
(Registered Trademark Symbol)	1
(Copyright Symbol)	2
a	3
b	4
c	5
d	6
e	7
f	8
g	9

Table 20. Hex Codes and Dot Patterns

ASCII Hex Value	Binary Code	Dot Pattern
0	0000	))))
1	0001	)))#
2	0010	))#)
3	0011	))##
4	0100	)#))
5	0101	)#)#
6	0110	)##)
7	0111	)###
8	1000	#)))
9	1001	#))#
A	1010	#)#)
B	1011	#)##
C	1100	##))
D	1101	##)#
E	1110	###)
F	1111	####

Example The following example illustrates the creation of the standard size Registered Trademark symbol defined for "a". The symbol is 12 dot columns wide by 12 rows high.

```
^PY^-^F^-
^M0101^za0C0,
330,408,5C8,
924,924,9C4,
944,528,408,
330,0C0^G
^M01,01,000^T0020^Z3^-
^O^-^PN^-
```

Symbols, Creating Expanded User Defined

Purpose To create specialized expanded symbols. An optional fill command can define large expanded symbols.

Mode Graphics with an Extended Graphics Command selected

Format (cc) z *x ht wd data* [f *n pattern*] (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
z	The Create Symbol command. Enter lowercase **z**.
x	Represents the symbol being defined. Enter an uppercase character from **A** through **F** to specify where your symbol is stored. (Make a note of this character; you need it in your Print Symbols command when you print the symbol as discussed on page 150.)
ht	Specifies the height of the symbol in dot rows from **001** through **108**. If a value of 000 or greater than 108 is entered, it defaults to the maximum value of 108. You must include the leading zeros when entering this data.
wd	Specifies the width of the symbol in character cells from **001** through **022**. If a value of 000 or greater than 022 is entered, it defaults to the maximum value of 022. You must include the leading zeros when entering this data.
data	The data required to define the symbol. Enter a hex value of **0** through **F** to define the dot pattern for each character cell. (Each character cell is comprised of 4 dots each.) See Table 20 to select dot patterns. Since one character cell represents 4 dot columns, the smallest symbol you can create is 4 dot columns wide by 1 dot row high. You can define up to 2,376 character cells (108 dot rows X 22 character cells per row). If more than the total of 2,376 character cells are defined, the extra data is ignored until a valid terminator, such as (cc)G, (cc)-, or (cc)* is found.
f	(Optional) Fills a specified number of character cells with a repeated dot pattern. Enter lowercase **f**.
n	Specifies the number of character cells to fill. Enter a decimal value from **0001** through **9999**. A value of 0000 fills all remaining cells with a specified dot pattern.
pattern	Specifies the fill dot pattern. Enter a value from **0** through **F** from Table 20 to describe the dot pattern.

(cc)G Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command.

NOTE: If a syntax error occurs, or invalid data is entered in the command, the remaining data in the command sequence is ignored until a sequence terminator or SFCC is found. If the printer power is turned off or the printer is reset, all expanded symbol data is deleted.

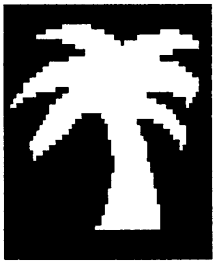
Comments

The ***zx*** command creates an expanded-size symbol. When you are ready to print the symbol, use the **Z** command as described on page 150.

Expanded User Defined Symbols command must be within a valid graphics sequence. They can measure up to 1-1/2 inches wide by 1-1/2 inches high, which equals 88 dot columns wide by 108 dot rows high. You can store a maximum of six expanded symbols in printer memory until the printer is reset or the printer power is turned off.

Example The following sample palm tree symbol illustrates the Expanded User Defined Symbol and the optional fill commands. The symbol measures 96 dot rows high by 64 dot columns, or 16 character cells wide, which equals a total of 1,536 character cells.

```
^PY^-
^F^-
^M01,01,020
^zA,096,016
f0112,F,f0004,F,C01,f0009,F,f0004,F,C01,f0009,F,f0003,F,8,f0003,0,1
f0004,F,03f0002,F,f0003,F,8,f0003,0,lf0004,F,03f0002,F
f0002,F,Cf0005,0,3F8,f0003,0,3F,f0002,F,Cf0005,0,3F8,f0003,0,3F
f0004,F,Cf0004,0,8,f0005,0,F,f0004,F,Cf0004,0,8,f0005,0,F
f0005,F,Cf0009,0,F,f0005,F,Cf0009,0,F,f0006,F,8f0006,0,f0003,F
f0006,F,8f0006,0,f0003,F,f0005,F,f0007,0,f0004,F,f0005,F,f0007,0,f000F
f0003,F,Cf0009,0,3f0002,F,f0003,F,Cf0009,0,3f0002,F,f0003,F,f0011,0,f0002,F
f0003,F,f0011,0,f0002,F,f0002,F,Cf0011,0,3F,f0002,F,Cf0011,0,3F
f0002,F,f0013,0,F,f0002,F,f0013,0,F,FCf0013,0,F,FCf0013,0,F
FC0,0Ff0010,0,F,FC0,0Ff0010,0,F,F03,FCf0006,0,FF01F,F03,FCf0006,0,FF01F
E3FF,f0007,0,1FF3F,E3FF,f0007,0,1FF3F,CFFC,f0008,0,3F7F,CFFC,f0008,0,3F7F
f0003,F,Cf0009,0,f0003,F,f0003,F,Cf0009,0,f0003,F,f0003,F,800,FCf0005,0,7FF
f0003,F,800,FCF0005,0,7FF,f0003,F,003FE,007C,03FF,f0003,F,003FE,007C,03FF
FFE,00,7FF,003,F80,FF,FFE,00,7FF,003,F80,FF,FFC,00,f0003,F,003,FE0FF
FFC,00,f0003,F,003,FE0FF,FF803,f0003,F,001,FF0FF,FF803,f0003,F,001,FF0FF
FF00,f0004,F,800,FFCFF,FF00,f0004,F,800,FFCFF,FF03,f0004,F800,FFDFF
FF03,f0004,F800,FFDFF,FF8,f0005,F,800,f0005,F,FF8,f0005,F,800,f0005,F
FFB,f0005,F,C00,f0005,F,FFB,f0005,F,C00,f0005,F,f0008,F,C007,f0004,F
f0008,F,8003,f0004,F,f0008,F,8003,f0004,F,f0008,F,8003,f0004,F
f0008,F,8003,f0004,F,f0008,F,8003,f0004,F,f0008,F,8003,f0004,F
f0008,F,0001,f0004,F,f0008,F,0001,f0004,F,f0008,F,0001,f0004,F
f0008,F,0001,f0004,F,f0008,F,0001,f0004,F,f0008,F,0001,f0004,F
f0007,F,E0000,f0004,F,f0007,F,E0000,f0004,F,f0007,F,Ef0004,0,f0004,F
f0007,F,Ef0004,0,f0004,F,f0007,F,Cf0004,0,f0004,F,f0007,F,Cf0004,0,f0004,F
f0007,F,Cf0004,0,f0004,F,f0007,F,Cf0004,0,f0004,F,f0007,F,f0005,0,f0004,F
f0007,F,f0005,0,f0004,F,f0000,F^G
^M01,01^ZA^-^*^*^*
^PN^-
```



Symbols, Printing

Purpose Prints specialized Standard or Expanded sized symbols previously created using the **z*x*** commands described on pages 145 and 148, respectively.

Mode Graphics with an Extended Graphics Command selected

Format (cc) Z *n* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
Z	The Print Symbol command. Enter uppercase **Z.**
n	Represents the symbol to print. See Table 19 on page 146. Enter the number **1** to print the registered trademark symbol; enter the number **2** to print the copyright symbol; enter the User Defined number from **3** through **9** which corresponds to the alphabetical value (“a” through “g”) you specified where the standard sized symbol is stored; or, enter an upper case character from **A** through **F** to select the corresponding Expanded User Defined Symbol. For example, in the program example shown on page 147, the symbol was created and stored at “a” (^za); when the symbol was *printed*, it was specified as 3 (^Z3).
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

The standard alphanumerics command must be input prior to the **Z** command. The alphanumeric height and width parameters do not affect the symbol. Horizontal tabs and justification commands and parameters affect symbol position.

Specialized standard and expanded symbols are printable only in the horizontal orientation and are printed according to the size specification when the symbol was created. However, you can rotate the standard Registered Trademark symbol and Copyright Symbol when the Append Rotated configuration parameter is enabled. Refer to the VGL configuration parameters tables in your *User's Manual.*

Blank spacing occurs between plotted elements if an undefined number or character is assigned to a symbol in the **Z** command. Specialized symbols created with the **z*x*** command remain in memory until the printer is reset or the printer power is turned off. Printing a specialized symbol after the data is lost causes VGL to react as if the symbol was created with null data, and blank spaces print in the place of the symbol.

Example The following sample commands illustrate the standard symbols. Notice that the standard alphanumerics command was sent for symbol positioning.

```
^PY^-
^M02,02,000^DCopyright ^Z2 1986^-
^M03,03,000ACME MOTOR ^Z1 Inc.^-
^PN^-
```

Tab, Horizontal

Purpose Specifies a new horizontal print position relative to the left page margin.

Mode Graphics with a Standard or an Extended Graphics Command selected

Format (cc) T *dis* [(cc)-]

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
T	The Horizontal Tab command. Enter **T.**
	^T as a Standard Graphics command sets a "permanent" left Graphics margin for the start of all Extended Graphics command sequences.
	A ^T as an Extended Graphics command adds to this "permanent" margin.

dis Normal Resolution:
Defines the horizontal tab in tenths of an inch plus dot columns from the left margin. Enter a three-digit value ranging from **000** through **999** to define a tab from 00.0 through 99.9 inches from the left margin and a fourth digit ranging from **0** through **9** to specify 0 through 9 additional dot columns. VGL automatically understands the decimal between the second and third digits for tenth inches and automatically interprets the fourth digit as dot columns. For example, 0120 (or 012,0) specifies a 1.2-inch plus no-dot column tab; 1016 (or 101,6) specifies a 10.1-inch plus 6-dot column tab.

High Resolution:
Defines the horizontal tab in thousandth inches. Enter a five-digit horizontal value ranging from **00000** through **99999** to define a horizontal tab of 0.000 inch through 99.999 inches. VGL automatically understands the decimal between the second and third digits.

The data to print at the new print position is input following the Horizontal Tab command.

(cc)- Graphics Mode CR used as a sequence terminator. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

NOTE: The (cc)- sequence terminator is used only when ^T is a Standard Graphics command.

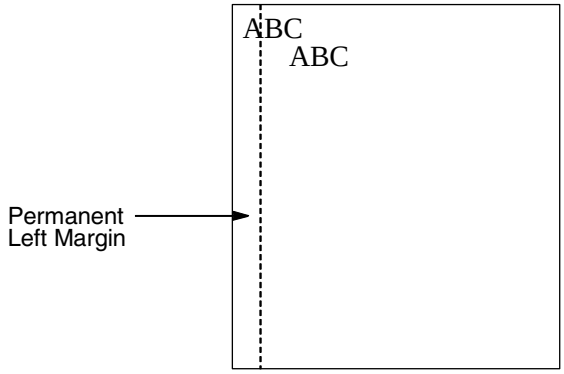
Comments

The T command may be input as part of the data in one of the alphanumeric commands and also may be used in standard graphics mode.

A 2-inch tab specifies a position 2 inches from the left margin; a 6-inch tab specifies a position 6 inches from the left margin, etc. Since the tab specifies a print position relative to the left print margin, you can use tabs to specify a print position to the left or right of the current position (unlike a typewriter, which can only tab to the right of the current position). For example, if the current print position is 4 inches from the left margin and a 1-inch tab is specified, the next print position is 1 inch from the left margin. This left/right capability is useful for positioning data within boxes of a form or similar applications.

Examples The following sample shows an Extended Graphics command placed before and after the ^T command. Notice that the left margin changes:

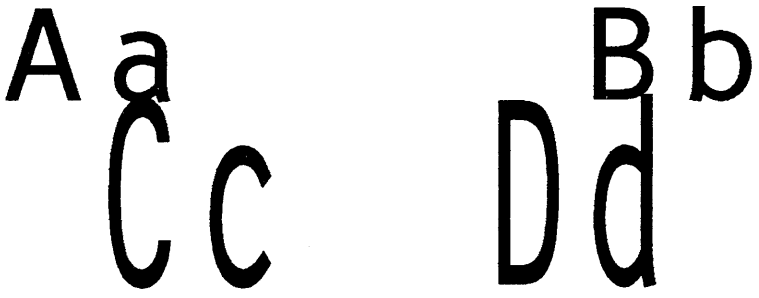
```
^M1010ABC^-
^T0100^-
^M1010ABC^-
```



The following sample commands illustrate horizontal tabs in normal resolution.

```
^PY^-
^M05,05,000Aa^T020,5Bb^T040,5Cc^-
-PN^-
```

```
^PY^-^F^-
^M05,05,000Aa^T030,0Bb
^M10,05,050^T005,0Cc^T025,0Dd^-
^O^-^PN^-
```




```
^PY^-
^V05,05,000I^V10,30,050^T010,0G^V05,05,075^T030,5P^-
^PN^-
```

```
^PY^-
^E05,05,000IGP^T025,5IGP^-
^PN^-
```

NOTE: Due to space constraints, the ^U commands below are separated into three lines. During actual VGL input, *do not* separate your command parameters.

```
^PY^-^F^-
^U06,05,000UP
^U03,03,070^T010,0SIDE
^U05,05,000^T022,0DOWN^-
^O^-^PN^-
```

Tab, Vertical

NOTE: The Vertical Tab command is not supported on L7032 printers.

Purpose Performs a vertical tab (VT, hex 0B) function to advance the paper to the next vertical tab position when used to terminate a standard graphics command.

Mode Graphics with a Standard Graphics Command selected

Format (cc)+

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
+	The graphics vertical tab mnemonic. Enter **+**.

Comments

The vertical tab functions as a carriage return only when it is used to terminate a graphics sequence in an extended graphics command when Free Format is enabled.

The vertical tab functions as a line feed:

- when the vertical tab is not used as a graphics command or graphics function terminator; and
- when the EVFU is not loaded through the use of form length or host commands.

If the EVFU is loaded but channel 12 is not loaded, then the vertical tab functions as a line feed. If channel 12 of the EVFU is loaded, the vertical tab skips to channel 12.

See “Electronic Vertical Format Unit (EVFU)” on page 73 for more information on EVFU and channel 12.

Underlined Print

Purpose Selects underlined printing.

Mode Graphics with a Standard Graphics Command selected

Format (cc) @ U (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
@	Specifies one of the @ commands. Enter @ to begin an @ command function.
U	Specifies the Underlined Print command. Enter **U** and all characters on the line are underlined. Underlined print is automatically reset upon receipt of the line terminator.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

Comments

Underlined print is a line-by-line print attribute; it is selected once and all characters in the line are underlined. The U command must precede any printable data in the line, and it is automatically reset when a line terminator is received.

Example The following example illustrates underlined print.

```
^PY^-
Standard Characters in the Graphics Mode^*
^@U^-Underlined characters: ABCDEFGHIJKLMNOPQRSTUVWXYZ^*
^PN^-
```

Standard Characters in the Graphics Mode

Underlined characters: ABCDEFGHIJKLMNOPQRSTUVWXYZ

Wait For Online

NOTE: The Wait For Online command is not supported on L7032 printers.

Purpose Causes VGL to discontinue processing data until you put the printer offline and then back online.

Mode Graphics with a Standard Graphics Command selected

Format (cc) @ W (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
@	Specifies one of the @ commands. Enter @ to begin an @ command function.
W	Specifies the Wait For Online command. Enter **W** and the front panel displays "Waiting on User" until you place the printer offline.
(cc)-	Graphics Mode CR. Enter the SFCC for your VGL configuration immediately followed by **-** to end the command sequence.

NOTE: Wait For Online must be given while VGL is in graphics mode (^PY), but not inside of a graphics pass (^M.....^-).

3 *Barcodes*

Overview

A barcode is a graphic representation of alphanumeric characters. Barcodes are produced by entering a barcode command to VGL in the Graphics mode using an Extended Graphics command.

You can print the barcodes horizontally, vertically, with or without a human readable data field, with default bar/space ratios, or with variable ratios. The human readable data field may be printed using any of the Extended Graphics command fonts available with the **(cc)S** or **(cc)IFONT,** commands.

Barcode symbols are configured in a series of varying width bars and spaces representing a specific barcode character set. These characteristics are in accordance with established industry-wide practices.

Several integrity checks are performed against the barcode data, and error messages are printed if any illegal data is discovered.

Each type of barcode has a different set of characters that can be barcoded, and VGL ensures that the data falls within the allowable set. Some barcodes permit a variable number of data characters, while other barcodes require a fixed number of data characters. VGL ensures that the data adheres to these constraints.

NOTE: Be sure you have set the proper printer mode as described in Chapter 2.

The single most important consideration when printing a barcode is to ensure the barcode will be scanned properly. Incorporating a barcode quality procedure in the printing process is the best way to ensure that barcodes are being printed correctly. A properly implemented validation procedure will increase overall barcode quality, reduce waste from misprinted barcodes, and Printronix achieve high first-time read rates, which is an increasingly important factor in newer, more efficient systems where manually entered data is not acceptable as a backup function. Validation also minimizes the costs of returned products due to poor reading or unaccountable barcodes. For more information on barcode validation, contact your Printronix representative, or visit our web site at **www.printronix.com**.

Examples

Using different printers may affect the printed appearance of your print samples compared to those shown in this manual due to the printer's scaling factor and varying print mode/densities. Print position also depends on your paper top-of-form position and the initial print position. Therefore, the location of the barcode print samples in this chapter are for reference only and do not reflect the actual barcode print position.

Barcode Size/Height Requirements

The length of any barcode is based on several factors:

(1) the type of barcode
(2) the number of data characters encoded
(3) the bar/space ratios

The starting position of a barcode is determined by any justifications specified in the previous alphanumeric command.

The alphanumeric command provides the proper length (height) of the bars in barcodes.

For horizontal barcodes, the graphics height command specifies barcode height; for vertical barcodes, graphics *width* specifies barcode height. Barcode height/width parameters are specified in the two-digit extended graphics command. A decimal point is automatically interpreted between the first and second character digits.

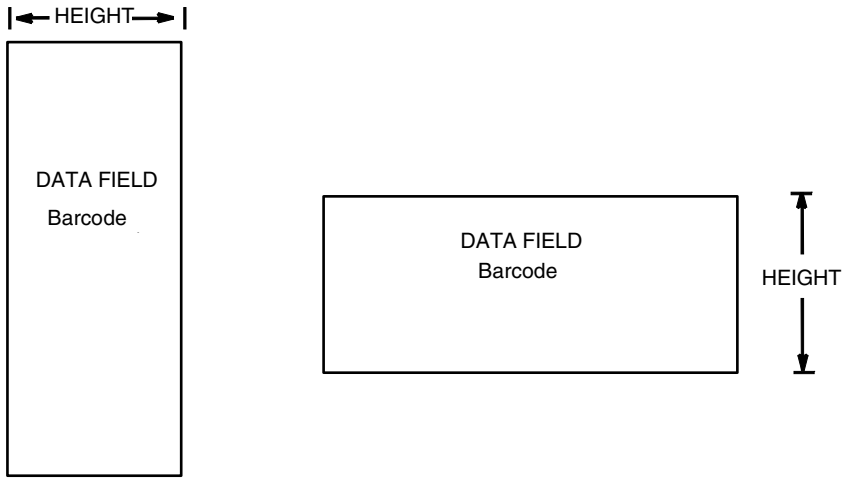


Figure 3. Barcode Size/Height Requirements

VGL allows you to add a human readable data field to the barcode. Also, you can specify a 1 or 3 dot gap between the human readable field and the barcode.

When you insert a human readable field, the height of the barcode automatically shortens. For example, you print a barcode that is 1" high. Later, you add a human readable data field. The barcode height is 1" minus the 1 or 3 dot gap and the text, which is 1/10" or 1/5".

If the barcode height is less than the height of the human readable text, the barcode height adjusts to the height of one dot. The gap and the human readable text remain the same.

Horizontal barcode data is printed below the barcode; vertical barcode data is printed to the left of the barcode. Figure 4 illustrates the readable data adjustment feature.

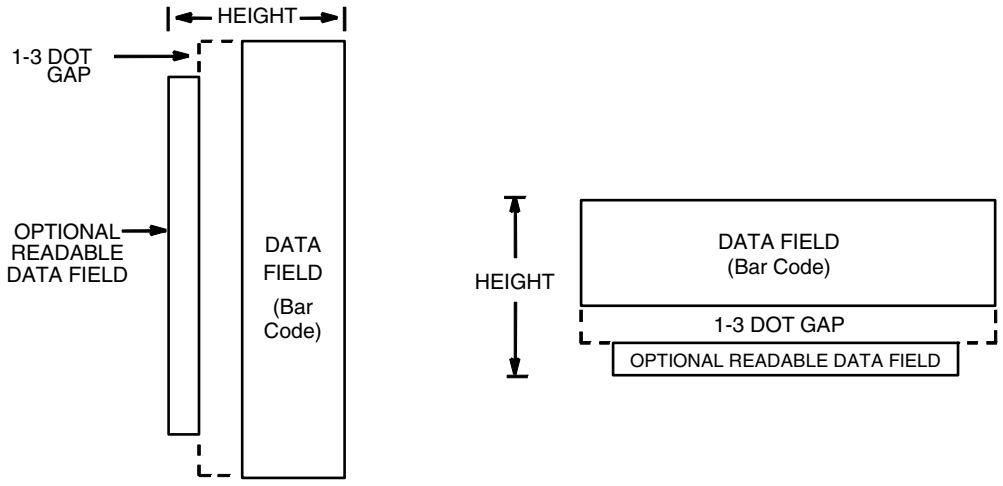


Figure 4. Barcode Height Adjustment

Barcode Command Format

Barcode commands are Extended Graphics commands which must occur within the Graphics Mode and must be introduced by an SFCC and one of the four alphanumeric commands (^M, ^V, ^E, and ^U). Data provided in the alphanumeric command sequence identifies specific height, width, and justification information used to define barcode length (height) and position. Complete alphanumeric command information is explained in Chapter 2.

NOTE: Throughout this manual, the caret (^) is used to represent the Special Function Control Code introducer and terminator for graphics and barcode commands. Be sure to use the appropriate control character for your VGL configuration.

VGL offers a choice between two types of barcode command formats which are described on the following pages: Standard (^B and ^C) barcode format, and IBARC, (a QMS Version II command). Two advantages of IBARC are a 4-way rotation, not 2-way, and dot or printer dot resolution for variable ratio barcodes. Neither the Standard nor IBARC format offers significantly more or less features; both formats accomplish the same task. The format you select is a matter of personal choice. In each barcode section throughout this chapter, each of the command parameters is fully described and examples provided using the standard barcode format (^B and ^C).

You can also print high resolution barcodes. With the control panel menu option, “Var Ratio Barcd” set to “High Resolution”, barcode variable ratio data can be specified in printer dots. You can use this option in either high or normal resolution with the IBARC command. (This option is ignored for ^B and ^C which always use low resolution.)

If “Var Ratio Barcd” is set to “Low Resolution” (the default), the barcode variable ratio data is interpreted as line matrix printer dots (60x72 dpi).

NOTE: When using variable ratio barcode commands, you must ensure the “scanability” of your barcodes, including toner spread compensation. Make sure the variable ratio conforms to the specification.

The barcode command and associated parameters for standard barcodes are described on page 163. IBARC, barcodes, associated parameters and examples are described on page 164.

NOTE: Each barcode parameter is visually separated by spaces, and optional parameters are marked by paired brackets [ ]; *do not* enter these spaces or brackets in your command sequence; they are provided throughout the manual for clarity in distinguishing parameters. Italicized text represents a variable parameter for which a value must be inserted. Command parameters not italicized must be input exactly as shown.

Standard Barcode Command Format

Default Ratio: (cc) *dir p type data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field by selecting one of five codes representing the font and gap size for the readable data field. The readable data field is printed below a horizontally configured barcode (picket fence orientation) and on the left-hand side of a vertically configured barcode (ladder orientation). The barcode size is automatically adjusted to allow for the height of the data field font and the spacing between the data and barcode.

NOTE: Vertical barcodes print only in standard 10 cpi font because OCR fonts cannot be rotated. If an OCR-type font is selected with a vertical barcode command, the standard 10 cpi font is substituted automatically.

9 or : Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications. Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type Represents the barcode type from Table 21 on page 167. Invalid codes are treated as errors.

ratio Represents unique ratio data for variable ratio barcodes. The default ratios shown in Table 21 are overridden by this feature. Four- and eight-digit ratios are used, depending upon the barcode selected.

data Represents the data to be barcoded.

(cc)G Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

IBARC, (Version II) Barcode Command Format

Default Ratio: (cc) IBARC, *type, loc, data* (cc)G

Variable Ratio: (cc) IBARC, *type,* [R [D] *ratio*,] *loc, data* (cc)G

When using the IBARC, barcode command format, the type code changes from a single alphanumeric value to a mnemonic as shown in Table 21. Using the appropriate alphanumeric command (^M, ^V, ^E, and ^U), IBARC, barcodes allow you to print barcodes in four orientations: horizontal, or rotated 90, 180 or 270 degrees. In addition, a *loc* parameter allows you to select one of three ways in which the printable data field appears below the barcode.

The barcode command parameters applicable to IBARC, barcodes are defined below. At the end of this section, several IBARC, examples are provided illustrating applications for these parameters.

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

IBARC, The Barcode command. Enter **IBARC,** (the comma is required).

type, Represents the IBARC, barcode type from Table 21. Invalid codes are treated as errors.

[R [D] *ratio*,] Optional parameter representing the ratios for variable ratio barcodes. The default ratios shown in Table 21 are overridden by the variable ratio feature. Four- and eight-digit ratios can be used, depending upon the barcode selected. Ratio data must be decimal values from 0 through 99. Enter **R**, followed by the actual barcode ratio. A colon must separate each element of the ratio.

Like standard barcode ratios, IBARC, ratios are also interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *narrow bar* : *narrow space* : *wide bar* : *wide space*.

If Variable Ratio Barcode is set to High Resolution or if the **D** parameter is specified, the ratios are represented in actual printer dots instead of line matrix printer dots (60 x 72 dpi).

NOTE: VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. When designing unique ratio data, carefully plot wide and narrow ratios to conform to readable barcodes.

loc Represents the location of the printable data field. Enter **N** for no printable data field, **E** to have the data field embedded in the barcode, or **B** to print the data field below the barcode. If this parameter is selected, the printable data field prints in the current font as selected by the (cc)S or (cc)IFONT commands or the default font selected.

data	Represents the data to be barcoded. The maximum amount of data depends on which barcode has been selected from Table 21.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

IBARC, Examples

The following examples illustrate use of the IBARC, command format using Code 39. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. Refer to Chapter 2 for a detailed description of alphanumeric commands.

Example 1 Code 39 horizontal barcode with embedded printable data field:

^*PY*^-^*M05,05,000*^**IBARC,C39,E,12345^G^-**^*PN*^-

Example 2 Code 39 barcode rotated 90° with printable data field printed below the barcode.

^*PY*^-^*V05,05,000*^**IBARC,C39,B,12345^G^-**^*PN*^-

Example 3 Code 39 barcode rotated 180° with printable data field printed below the barcode.

^*PY*^-^*U05,05,000*^**IBARC,C39,B,12345^G^-**^*PN*^-

Example 4 Code 39 barcode rotated 270° with embedded printable data field.

```
^PY^-^E05,05,000^IBARC,C39,E,12345^G^-^PN^-
```

Example 5 Code 39 barcode rotated 90° with no printable data field.

```
^PY^-^V05,05,000^IBARC,C39,N,12345^G^-^PN^-
```

Example 6 Code 39 horizontal barcode, embedded printable data field, and double the default ratio:

```
^PY^-^M05,05,000^IBARC,C39,R2:2:6:6,E,12345^G^-^PN^-
```

Barcodes

NOTE: When using standard barcode types (either (cc) B or (cc) C) select the appropriate type code from the Standard Type Code column in Table 21. When using the IBARC, barcode, select the appropriate type code from the IBARC, Type Code column in Table 21.

Table 21. VGL Barcode Types

Barcode Description	Standard Type Code	IBARC, Type Code	# of Data	Check Digits	Default Bar/ Space Ratios	Page #
Australian 4-State	s	AUSTPOST	Varied	None	n/a	169
BC 412	+	BC412	Varied	Mod 35	1:1	174
Codabar	D	CBAR	1-40	None	1:2:3:4:1:1:1:1	178
Code 39	A B C	C39 LOGMAR AIAG EMBARC C39A C39M43 HIBCC	1-40 1-40 1-40 1-40 1-40 1-40 1-40	None None None None None Mod 43 Mod 43	1:1:3:3 1:1:3:3 1:1:3:3 1:1:3:3 1:2:4:5 1:1:3:3 1:1:3:3	184
Code 93	i	C93	1-40	Mod 47	1:1:2:2:3:3:4:4	191
Code 128	Z	C128	1-40	Mod 103	1:1:2:2:3:3:4:4	195
EAN 8 EAN 8+2 EAN 8+5	U o p	EAN8 EAN8+2 EAN8+5	7 9 12	Mod 10	1:1:2:2:3:3:4:4	204
EAN 13 EAN 13+2 EAN 13+5	T m n	EAN13 EAN13+2 EAN13+5	12 14 17	Mod 10	1:1:2:2:3:3:4:4	209
German Interleaved 2/5	V W	POSTAGI POSTAGL	11 13	Mod 10	4:6:14:16	214
GS1-128, formerly UCC/EAN-128	q	UCC128	see Note below	Mod 103/10	1:1:2:2:3:3:4:4	219
GS-1 Datamatrix, formerly Datamatrix	M	DATAMATRIX	Varied	n/a	n/a	230
Identicon	E	IDENTICON	1-40	None	1:1:3	239
Intelligent Mail 4-state	j	INTMAIL	20-31	Automatic	n/a	242

Table 21. VGL Barcode Types (continued)

Barcode Description	Standard Type Code	IBARC, Type Code	# of Data	Check Digits	Default Bar/ Space Ratios	Page #
Interleaved 2/5 	K k L l	INT2/5 INT2/5CD INT2/5A INT2/5CDA	1-40 1-40 1-40 1-40	None Mod 10 None Mod 10	1:1:3:3 1:1:3:3 1:2:4:5 1:2:4:5	244
Maxicode	%	MAXICODE	depends on mode used	None	N/A	249
MSI 	F G H I X	MSI MSI10 MSI1010 MSI1110 MSI11	1-13 1-13 1-13 1-13 1-13	None Mod 10 Mod 10/10 Mod 11/10 Mod 11	1:1:2:2	254
PDF417	&	PDF417	Variable	None	n/a	260
Planet	r	PLANET	11	Mod 10	n/a	264
POSTNET	*	POSTNET	5, 9, or 11	Mod 10	n/a	269
Royal Mail	Y	ROYALBAR	Varied	Mod 6	3:6	273
Telepen	J	TELEPEN	1-40	Mod 127	1:1:3:3	275
UPC-A UPC-A+2 UPC-A+5 UPC-A 80% UPC-A100%	P a b 0 1	UPCA UPCA+2 UPCA+5 UPCA80 UPCA100	11 13 16 11 11	Mod 10 Mod 10 Mod 10	1:1:2:2:3:3:4:4 1:1:2:2:3:3:4:4 1:1:2:2:3:3:4:4	280
UPC-E UPC-E0 UPC-E+2 UPC-E+5 UPC-E0+2 UPC-E0+5	Q R c d e f	UPCE UPCE0 UPCE+2 UPCE+5 UPCE0+2 UPCE0+5	10 6 12 15 8 11	Mod 10	1:1:2:2:3:3:4:4	285
UPCSHIP	$	UPCSHIP	13	Mod 10	1:1:3:3	293
UPS 11	u	UPS11	10	Mod 103	1:1:2:2:3:3:4:4	297

NOTE: Data requirements for UCC/EAN-128 is determined by the application identifier preceding the barcode data. There is a wide range of selections.

Australian 4-State

The Australian 4-State structure is shown in Figure 5 and described on the following pages.

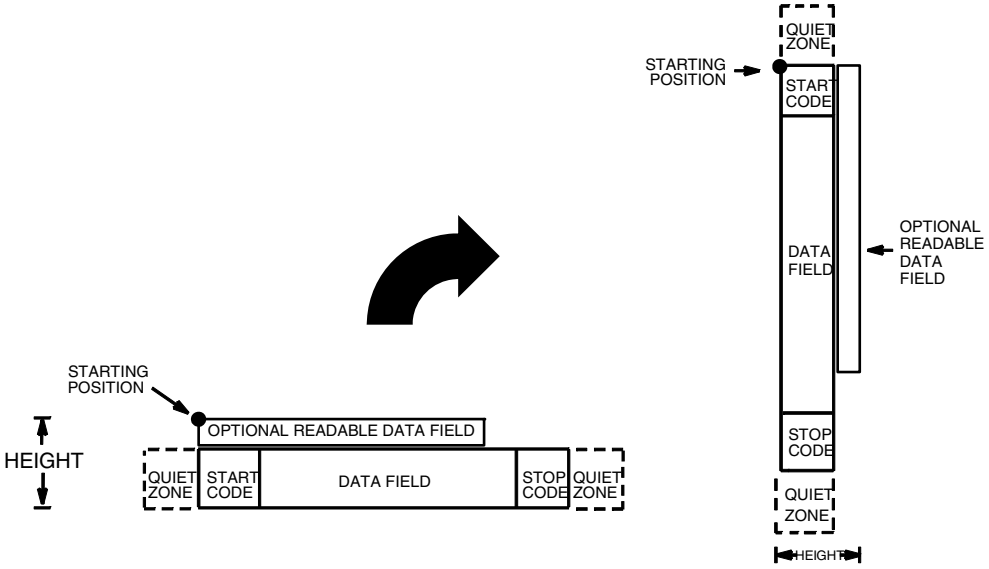


Figure 5. Australian 4-State Structure

The Australian 4-State barcode supports the Australian Postal Service. Australian 4-State barcodes are similar to POSTNET in terms of bar space and width, but have four different types of bars (Full Height, Ascender, Descender, and Tracker), whereas POSTNET only has two bar types (Tall and Short).

The Australian 4-State symbology converts alphanumeric characters into patterns of four bars, using combinations of Full Height, Ascender, Descender, and Trackers. It also adds start and stop barcodes as well as Reed-Solomon parity information.

Quiet Zone

Quiet zones extend on both ends of the barcode to permit the scan to begin and end in a blank area. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Code

The start and stop bars identify the orientation of the barcode. The start bar consists of an ascender bar, and is positioned at the leftmost end of the barcode. The stop bar consists of a full height bar, and is positioned at the rightmost end of the barcode adjacent to the check digit.

Data Field

Australian 4-State barcodes use four types of bars to encode its data: Full Height, Ascender, Descender, and Tracker. Each Full Height bar is 0.198 inch ± 0.030 inch. The Ascender and Descender bars are about 62.5% of the Full Height bar in length, while the Tracker bar is about 25% of the Full Height bar.

Each bar *width* is equal, and must be .020-inch ± .005-inch. Horizontal spacing between bars (pitch) must be 22 bars ± 2 bars per inch over any 0.50-inch portion of the barcode.

The Australian 4-State barcode data field consists of four different sections: the FCC, Sorting Number, Customer Data, and Reed-Solomon parity information. The FCC is a two-digit code specifying the format of the barcode (see Table 23). The Sorting Number is an 8-digit code used to sort the mail item. Customer Data is optional and is only allowed on certain formats (as indicated by the FCC selected). VGL emulation automatically generates the Reed-Solomon parity information and includes it in the barcode.

Check Digit

No check digit is calculated for the Australian 4-State barcode. The Reed-Solomon parity information is automatically included.

Australian 4-State Command Format

NOTE: See page 164 for the IBARC, command format and definitions. (This barcode will not print vertically using the IBARC, command format.)

Default Ratio: (cc) *dir p* s [F*n*] [I*n*] *data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.
p	Prints the optional readable data field. The readable data field is printed left-aligned above a horizontal barcode or top-aligned to the right of a vertical barcode. Replace *p* in the barcode command with one of the codes listed in Table 22 to print the readable data field in the corresponding font with the specified guard band gap.

Table 22. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

s	The Australian 4-State type code. Enter **s**.
F*n*	Specifies the FCC code, which defines the format of the barcode and its size. If no value is specified, the FCC defaults to a value of 11. Enter **F**, then one of the values shown in Table 23.
I*n*	Specifies the format of the customer information field. If no value is specified, the information field defaults to a value of 1. Enter **I**, then one of the values shown in Table 23.

Table 23. FCC Codes, Customer Information Fields and Maximum Barcode Lengths

FCC (F*n*)	Customer Information (I*n*)	Valid Data	Maximum Length (Sorting Number + Customer Data)
11, 87, 45, or 92	n/a	Any	8 + 0
59	1	A-Z, a-z, 0-9, space, #	8 + 5
59	2	0-9	8 + 7
59	3	0-3	8 + 15
44, 62	1	A-Z, a-z, 0-9, space, #	8 + 10
44, 62	2	0-9	8 + 15
44, 62	3	0-3	8 + 30

data The barcode data. See “Data Field” on page 170 for a description of the Australian 4-State barcode data field.

NOTE: For a **I*n*** value of 3, the digits 0 through 3 represent the following bars: 0 = Full Height; 1 = Ascender; 2 = Descender; 3 = Tracker. Since this is a proprietary encoding, the Customer Data is not included in the optional readable data field.

(cc)G Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Australian 4-State Examples

The following command generates the horizontal Australian 4-State barcode below. In the command sequence, Graphics Mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,100^KF^**BYsF62I100141544adc0grell7**^**G**^*KF^-^PN^-*

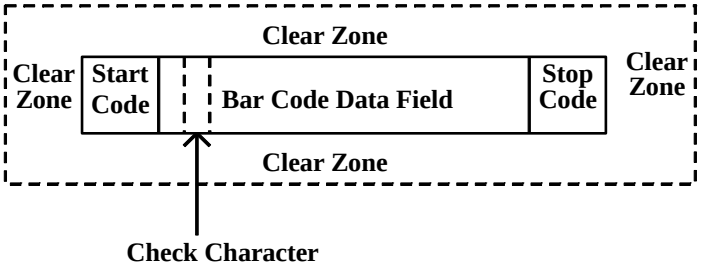
^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width selected was at 1.0 inches.
A 1.0 justification value plus 0 additional dots was selected for the data placement.
^KF activated Dark Print.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter s selected Australian 4-State barcode type.
F62 selected an FCC Code value of 62.
I1 selected a customer information field value of 1.
00141544adc0grell7 is the barcode data. 00141544 is the sorting data, and adc0grell7 is the customer data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the vertical Australian 4-State barcode below using standard 10 cpi font, FCC Code value of 59, customer information field value of 1, and data of 0123456789076 (01234567 is the sorting data, and 89076 is the customer data):

*^PY^-^M10,10,050^KF^***CYsF59I10123456789076^G***^KF^-^PN^-*

BC412 Barcode

The BC412 barcode was invented by IBM in 1988 to meet the needs of the the semiconductor wafer identification application. The word BC stands for binary code (presence or absence of a bar) and 412 means 4 bar modules in a total of 12 module positions in every character. It is a one dimensional barcode that meets the requirements of small space, easy scribing and robust decoding even if the barcode symbols are under poor light contrast. It can achieve a density of 23 characters in less than an inch with a 3.3 mil bar width.



Data Field

Data BC412 can accommodate 35 characters, 0 - 9 and A - Z. The number 0 is used in place of the letter O. Table 24 lists the character with it's corresponding module sequence and character value.

Quiet/Clear Zone

The barcode structure requires a completely blank clear zone which extends 4.75 inches from the right edges of the mail piece. In addition, a minimum clear zone of 0.040 inch above and below the barcode data must also be provided.

Start/Stop Code

The start and stop pattern identify the orientation of the barcode. The start code is bar,space,space" in all cases. The stop code is bar, space, bar for all cases.

I = Bar

- = Space

Table 24. BC412 Character, Module Sequence, and Character Value

Character	Module Sequence	Character Value
0	I-I-I-I-----	00
1	I-I-I--I----	15
2	I-I-I---I---	17
3	I-I-I----I--	29
4	I-I-I-----I-	11
5	I-I--I-I----	33
6	I-I--I--I---	19
7	I-I--I---I--	21
8	I-I--I----I-	08
9	I-I---I-I---	02
A	I-I---I--I--	07
B	I-I---I---I-	25
C	I-I----I-I--	20
D	I-I----I--I-	22
E	I-I-----I-I-	09
F	I--I-I-I----	30
G	I--I-I--I---	03
H	I--I-I---I--	06
I	I--I-I----I-	27
J	I--I--I-I---	16
K	I--I--I--I--	24
L	I--I--I---I-	04
M	I--I---I-I--	34
N	I--I---I--I-	12
P	I--I----I-I-	32
Q	I---I-I-I---	18
R	I---I-I--I--	01
S	I---I-I---I-	14

Table 24. BC412 Character, Module Sequence, and Character Value

Character	Module Sequence	Character Value
T	I---I--I-I--	13
U	I---I--I--I-	26
V	I---I---I-I-	05
W	I----I-I-I--	31
X	I----I-I--I-	28
Y	I----I--I-I-	23
Z	I-----I-I-I-	10
Start	I--	
Stop	I-I	

Check Code

The BC412 has a mod 35 check character. The check character is placed in the second position behind the first data character. The check code is automatically included in the bar structure; however, it is not included in the PDF. The check digit computation is shown below.

Let D = D1D2....Dn be a string of n data characters and C = C1C2....Cn+1 be a string value of n+1 encoded characters.

V1 = Character value of C1. Refer to Table 24.

Fo = (Sum of Odd V1) Mod 35

Fe = (Sum of Even V1) Mod 35

F = (Fo + 2Fe) Mod 35

Since the second character is the check character, designate the second character of C1C2.... as the check character of D.

Set C2 = 0
therefore C1C3C4.... Cn+1 = D1D2D3....Dn.

Calculate Fo, Fe, and F

C2 = the character that has the check character value 17F Mod 35.

Example

Assume that the data character string is AQ1557

Form the character string C = A0Q1557

Fo = (7 + 18 + 33 + 21) Mod 35

= 79 Mod 35

= 9

Fe = (0 + 11 + 19) Mod 35

= 34 Mod 35

= 34

F = (9 + 2*34) Mod 35

= 77 Mod 35

= 7

Character value of the check character is = 17*7 Mod 35

= 119 Mod 35

= 14

As referenced in Table 24, 14 is the character value of character “S.” Therefore, the check character is “S.”

Barcode Ratio

Default ratio is: 1:1.

Note: The BC412 barcode is not yet available for impact printers.

BC412 Standard Command Format

Default Ratio: (cc) dir N Y data (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.
N	Turns off the readable data field. Enter **N**.
Y	The type code for BC412. Enter **+**.
data	The barcode data. A check digit is automatically added by VGL.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

BC412 Example

The following command generates the horizontal BC412 barcode below:

```
^PY^-^M05.05.100^T0100^BN+12345ABCDE^G^-^PN^-
```

Codabar

The Codabar structure is shown in Figure 6 and described on the following pages.

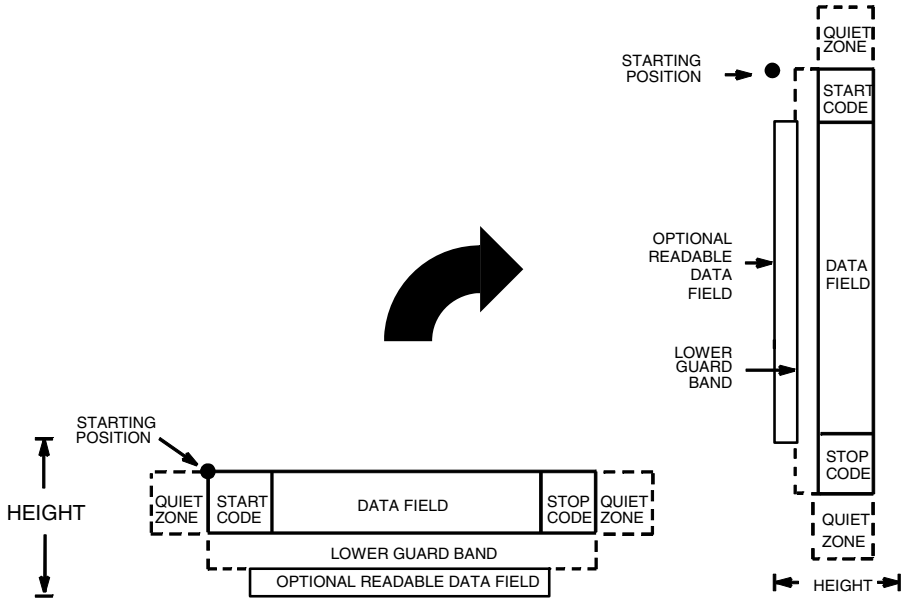


Figure 6. Codabar Structure

Quiet Zone

Quiet zones extend on both ends of the barcode to permit the scan to begin and end in a blank area. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

The start/stop codes identify the leading and trailing end of the barcode. Four start/stop code characters (A, B, C, and D) are available in any combination as start/stop codes. The start/stop code character must be included in the data field to be produced with the barcode.

Data Field

The barcode symbol uses a series of wide and narrow bars and spaces to represent numeric characters and six control characters. Each character is represented by seven elements consisting of four bars and three spaces, either wide or narrow.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. Barcode data is printed below the horizontal barcode symbol and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected.

Codabar Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p* D *data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] D [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 25 to print the readable data field in the corresponding font with the specified guard band gap.

Table 25. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :
: Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

  Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

  Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

D
: The Codabar type code. Enter **D**.

ratio
: Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. The default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**; VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. For example, VGL accepts wide/narrow ratio values of 2 and 5, respectively; however, a narrow element larger than the wide element produces an unreadable barcode. When designing unique ratio data, carefully plot wide/narrow ratios to conform to readable barcodes.

Codabar barcodes require an eight-digit ratio. The ratios are interpreted from left to right, measuring the size of each bar or space in dot width. The first four digits are interpreted as follows: *narrow bar* : *narrow space* : *wide bar* : *wide space*. The sixth digit specifies the number of dots for the intercharacter spacing. The fifth, seventh and eighth digits are not used; any data in these positions is ignored. For example, if the Codabar ratio data was 24681211, it would be translated as follows:

2-dot-wide narrow bar
4-dot-wide narrow space
6-dot-wide wide bar
8-dot-wide wide space
ignore data
2-dot-wide intercharacter spacing
ignore data
ignore data

data — The barcode data. Codabar encodes from 1 through 40 characters from the Codabar Character Set shown in Table 26. Characters A, B, C, and D are strictly start/stop codes.

(cc)G — Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Table 26. Codabar Character Set

Character	Hex	Character	Hex
0	30	+	2B
1	31	-	2D
2	32	.	2E
3	33	/	2F
4	34	$	24
5	35	:	3A
6	36	A*	41
7	37	B*	42
8	38	C*	43
9	39	D*	44

*A, B, C and D are start/stop codes only.

Codabar Examples

The following command generates the horizontal variable ratio Codabar barcode below. In the command sequence, Graphics Mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

*^PY^-^M10,10,000^KF^***BYDA2468B^G^***KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width selected was at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for the data placement.
^KF activated Dark Print.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter D selected Codabar barcode type.
A2468B is the barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the horizontal Codabar barcode below using OCR-B font, double the default ratio, and data of A2468B:

*^PY^-^M10,10,000^KF^***BB9D24681211A2468B^G^***KF^-^PN^-*

The following commands generated the vertical Codabar barcodes below using standard 10 cpi font with the standard default ratio and data of A2468B:

```
^PY^-^M10,10,000^KF^CYDA2468B^G^KF^-^PN^-
```

The following command generates the same vertical Codabar barcode described above, except that double the default ratio is used:

```
^PY^-^M10,10,000^KF^CY9D24681211A2468B^G^KF^-^PN^-
```

Code 39

The Code 39 structure is shown in Figure 7 and described on the following pages.

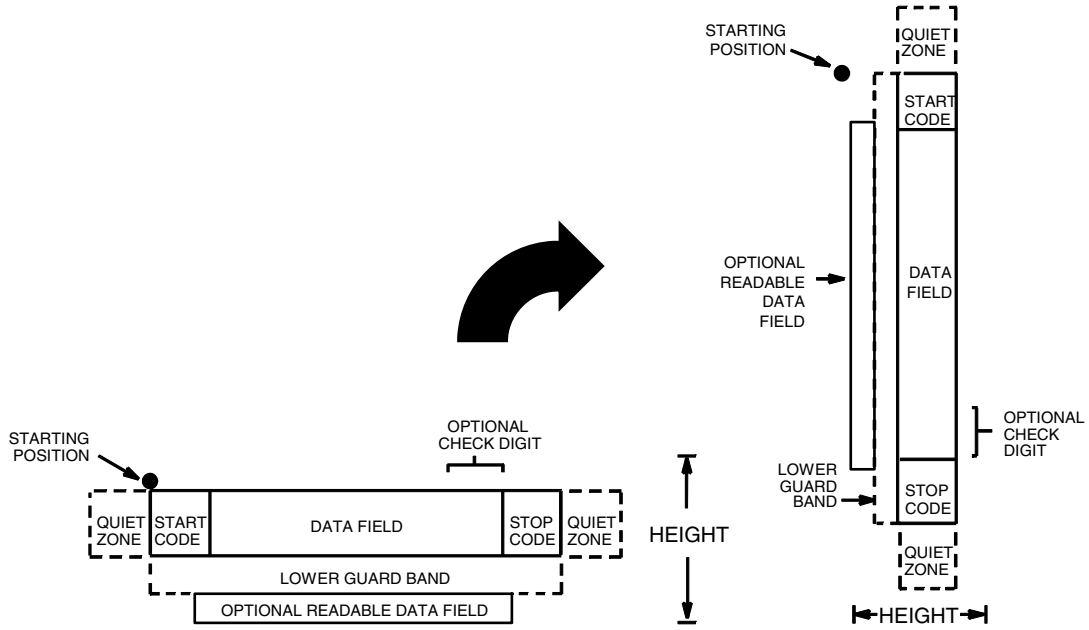


Figure 7. Code 39 Structure

Quiet Zone

Both ends of the barcode structure require blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

The start/stop code is a unique character identifying the leading and trailing end of the barcode. The start/stop code is automatically produced with each barcode. The start/stop code structure permits bidirectional barcode scanning.

Data Field

The barcode symbol uses a series of wide and narrow bars and spaces to represent standard alphanumeric characters. Each wide or narrow bar or space is 1 element; each character in the data field has 9 elements. The structure is 3 wide elements (bars or spaces) out of the 9 total elements that compose one character.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. Barcode data is printed below the horizontal barcode symbol and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected.

Check Digit

Code 39 Type C inserts the modulo-43 check digit into the barcode. This feature provides a means of verifying accurate scanning.

Code 39 Command Format

NOTE: Refer to page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p type data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes in Table 27 to print the readable data field in the corresponding font with the specified guard band gap.

Table 27. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or : Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type Selects the barcode type. Code 39 types available are shown in Table 28. Enter the Type Code corresponding to the Code 39 type desired.

Table 28. Code 39 Barcodes

Standard Type Code	IBARC, Type Code	# of Data Characters	Check Digits	Default Bar/ Space Ratios*	Ratio
A	C39	1-40	None	1:1:3:3	1:3
B	C39A	1-40	None	1:2:4:5	1:3
C	C39M43	1-40	Mod 43	1:1:3:3	1:3
	LOGMAR	1-40	None	1:1:3:3	
	HIBCC	1-40	Mod 43	1:1:3:3	
	AIAG	1-40	None	1:1:3:3	
	EMBARC	1-40	None	1:1:3:3	

* Ratios represent dot width of the bar/space elements as follows:
Narrow Bar : Narrow Space : Wide Bar : Wide Space.

ratio Optional parameter (used in conjunction with parameter **9** or **:**) representing the ratios for variable ratio barcodes. The default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**. VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

Code 39 barcodes use four-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width according to the following pattern: *narrow bar : narrow space : wide bar : wide space*. For example, enter 2266 in the ratio parameter for:

2 dot-wide narrow bar
2 dot-wide narrow space
6 dot-wide wide bar
6 dot-wide wide space.

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. For example, VGL accepts wide/narrow ratio values of 2 and 5, respectively; however a narrow element larger than the wide element produces an unreadable barcode. When designing unique ratio data, carefully plot wide and narrow ratios to conform to readable barcodes.

data	The barcode data. Code 39 encodes 1 through 40 characters from the Code 39 full ASCII Character Set shown in Table 29.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Table 29. Code 39 Character Set

ASCII	CODE 39	ASCII	CODE 39	ASCII	CODE 39	ASCII	CODE 39
NUL	%U	SP	Space	@	%V	`	%W
SOH	$A	!	/A	A	A	a	+A
STX	$B	"	/B	B	B	b	+B
ETX	$C	#	/C	C	C	c	+C
EOT	$D	$	/D	D	D	d	+D
ENQ	$E	%	/E	E	E	e	+E
ACK	$F	&	/F	F	F	f	+F
BEL	$G	'	/G	G	G	g	+G
BS	$H	(	/H	H	H	h	+H
HT	$I	)	/I	I	I	i	+I
LF	$J	*	/J	J	J	j	+J
VT	$K	+	/K	K	K	k	+K
FF	$L	,	/L	L	L	l	+L
CR	$M	—	—	M	M	m	+M
SO	$N	.	.	N	N	n	+N
SI	$O	/	/O	O	O	o	+O
DLE	$P	0	0	P	P	p	+P
DC1	$Q	1	1	Q	Q	q	+Q
DC2	$R	2	2	R	R	r	+R
DC3	$S	3	3	S	S	s	+S
DC4	$T	4	4	T	T	t	+T
NAK	$U	5	5	U	U	u	+U
SYN	$V	6	6	V	V	v	+V
ETB	$W	7	7	W	W	w	+W
CAN	$X	8	8	X	X	x	+X
EM	$Y	9	9	Y	Y	y	+Y
SUB	$Z	:	/Z	Z	Z	z	+Z
ESC	%A	;	%F	[	%K	{	%P
FS	%B	<	%G	\	%L	|	%Q
GS	%C	=	%H	]	%M	}	%R
RS	%D	>	%I	^	%N	^	%S
US	%E	?	%J	_	%O	DEL	%T %X %Y %Z

NOTE: Character pairs /M, /N, and /P through /Y are reserved for future control character pairs.

Code 39 Examples

The following command generates the horizontal default ratio Code 39 barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,000^KF^**BYA$25NW20%^G**^*KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for the data placement.
^KF activated Dark Print.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter A selected Code 39 Type A.
$25NW20% is the barcode data, and ^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print, and ^PN^- terminated the graphics mode.

The following command generated the horizontal Code 39 barcode below using OCR-A font, double the default ratio, and data of $25NW20%:

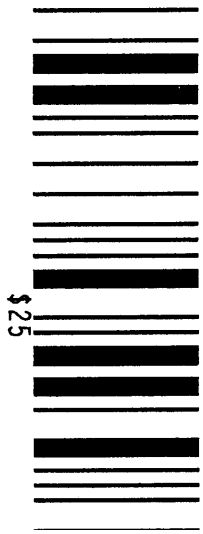
^PY^-^M10,10,000^KF^**BO9A2266$25NW20%^G**^*KF^-^PN^-*

The following commands generated the vertical Code 39 barcodes below using standard 10 cpi font, the standard default ratio, and data of $25:

^PY^-^M10,10,000^KF^**CYB$25^G**^*KF^-^PN^-*

The following command generates the same vertical Code 39 barcode described above, except that double the default ratio is used:

^PY^-^M10,10,000^KF^**CY9B248A$25^G**^*KF^-^PN^-*



Code 93

The Code 93 structure is shown in Figure 8 and described on the following pages.

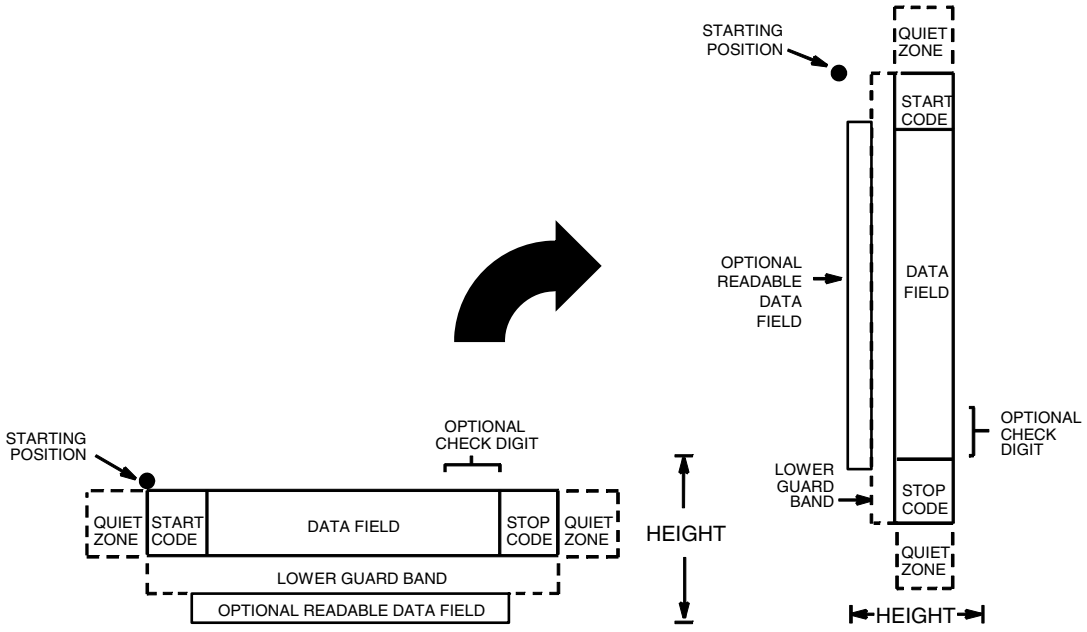


Figure 8. Code 93 Structure

Quiet Zone

Both ends of the barcode structure require blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

The start/stop code is a unique character identifying the leading and trailing end of the barcode. The start/stop code is automatically produced with each barcode. The start/stop code structure permits bidirectional barcode scanning.

Data Fields

The barcode symbol uses a series of varying width bars and spaces to represent the full ASCII character set. Bars and spaces vary in width from 1 through 4 modules. Each character consists of 2 bars and two spaces that total 7 modules. The symbol coding of the left data field is different from the right data field to permit read direction sensing.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. Barcode data is printed below the horizontal barcode symbol and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected.

Check Digit

Code 93 inserts the modulo-47 check digit into the barcode. This feature provides a means of verifying accurate scanning.

Code 93 Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p* i *data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] i [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the following codes to print the readable data field in the corresponding font with the specified guard band gap.

Table 30. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :
: Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

  Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

  Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

i
: The type code for Code 93. Enter **i**.

ratio
: Optional parameter (used in conjunction with parameter **9** or **:**) representing the ratios for variable ratio barcodes. The default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**. VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

  Code 93 barcodes use eight-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space in dot width, in the following pattern: *1 module wide bar* : *1 module wide space* : *2 module wide bar* : *2 module wide space* : *3 module wide bar* : *3 module wide space* : *4 module wide bar* : *4 module wide space*. For example, enter 22446688 in the ratio data field for:

  2 module wide bar
  2 module wide space
  4 module wide bar
  4 module wide space
  6 module wide bar
  6 module wide space
  8 module wide bar
  8 module wide space

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable bar/space element relationships for barcode readability. When designing unique ratio data, carefully plot bar/space ratios to conform to readable barcodes.

data
: The barcode data. Code 93 encodes from 1 through 40 characters. They can be any ASCII characters 0-127.

(cc)G
: Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Code 93 Example

The following command generates the horizontal default ratio Code 93 barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

```
^PY^-^F^-
^M1010100^IBARC,C93,B,1234ABCD^G^-
^PN^-
```

^PY^- enabled the graphics command sequence.
^F^- enabled Free Format.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 1.0 justification value plus 0 additional dots was selected for the data placement.
^IBARC, introduced the barcode command.
C93, selected Code 93.
B, prints the readable data field below the barcode.
1234ABCD is the barcode data, and ^G^- terminated the barcode command sequence.
^PN^- terminated the graphics mode.

Code 128

Code 128 includes three subsets: A, B, and C. All contain the same bar patterns, except for the unique start character instructing the barcode reader which subset is being used. Special characters are available for switching between the subsets in order to generate the shortest possible barcode. The Code 128 structure is shown in Figure 9 and described on the following pages.

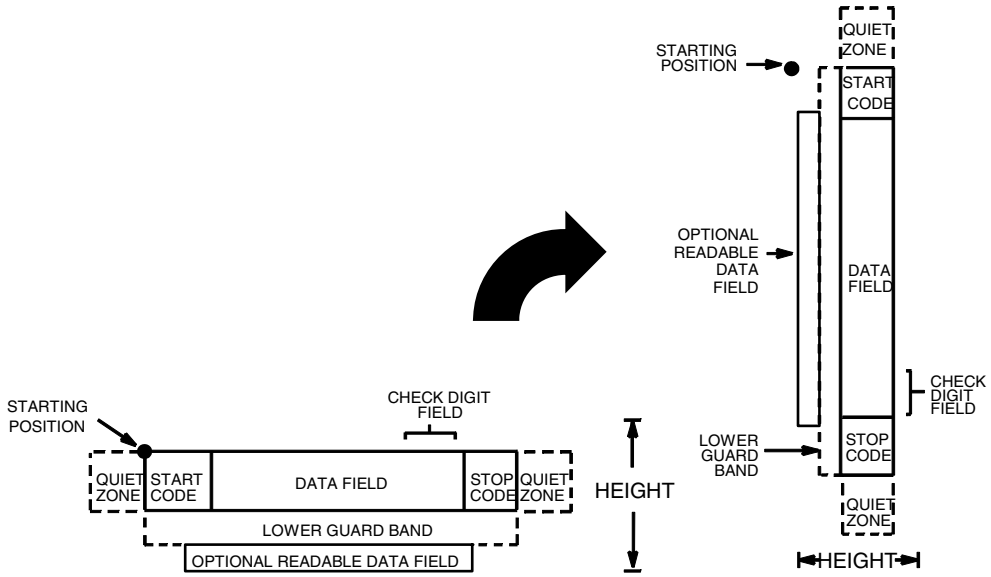


Figure 9. Code 128 Structure

Quiet Zone

Both ends of the barcode structure require blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

Code 128 contains special characters which use unique start/stop codes to identify the leading and trailing end of the barcode. In the automatic mode, start and stop codes are generated automatically. In the manual mode, you must supply the start code, but the stop code is generated automatically.

Data Field

Code 128 barcodes support a full ASCII character set: Subset A provides standard alphanumeric keyboard characters, control and special characters; subset B includes all standard alphanumeric keyboard characters, lowercase alphabetical characters, and special characters; subset C provides 100 digit pairs, from 00 through 99 inclusive, plus special characters. Table 32 lists the full Code 128 character set.

Control characters, identified by a “greater than” (>) symbol, introduce Special Function Control Codes so that you can manually supply control codes to shift between subsets as described in the “Mode Selection” section, below. The bars and spaces vary in width from 1 through 4 modules. Each character consists of 3 bars and 3 spaces that total 11 modules.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. Barcode data is printed below the horizontal barcode symbol, and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected. The readable data field is available only in the automatic mode.

Check Digit

For Code 128, the modulo-103 check digit is automatically calculated and inserted in the barcode symbol. The check digit verifies accurate scanning. The start code is included in the check digit algorithm.

Mode Selection

VGL generates Code 128 barcodes in one of two modes: automatic or manual.

Automatic Mode

VGL creates the shortest possible barcode by automatically sending the subset switch characters (characters preceded by >) to switch from subset B into subset C whenever strings of four or more consecutive numeric characters are provided. As long as the data includes ordinary keyboard characters and no subset switch, VGL switches in and out of subsets B and C automatically before and after numeric character strings. Start codes, stop codes, and check digits are generated automatically.

NOTE: The code >0 is not a special character; VGL recognizes >0 as the “greater than” character (>) on a standard ASCII chart.

Manual Mode

The manual mode is selected by inputting a subset switch character (characters preceded by >) anywhere in the barcode data. In the manual mode, you must insert the special codes into the barcode command to switch to another subset. Once a special code is found in the data, all automatic switching features are suspended, the readable data field option is cancelled, and VGL expects you to provide all special code switching commands. In this mode, you must supply the start code; if no start code is provided, VGL inserts a subset B start code. Stop codes and check digits are generated automatically in the manual mode. More information about Manual Mode is provided in the following section.

Manual Mode Operation

NOTE: In the manual mode, you are responsible for correct implementation of Code 128 in accordance with the Code 128 Standards Manual.

The Code 128 character set is shown in Table 32. The **Alternate** column identifies the special subset switch characters that switch VGL to the manual mode. These > characters are also horizontally aligned with functions also performed in an automatic mode. For example, >/ represents SI in subset A, o in subset B, and value 79 in subset C. Thus, the following commands generate the same barcode using **Alternate** characters, or subsets B or C:

Subset Switch Characters:	^BNZ>7>,>->.>/^G
Subset C:	^BNZ>576777879^G
Subset B:	^BNZ>6lmno^G

Non-ASCII characters are specified by using the subset switch characters (from >1 through >8 in the **Alternate** column on Table 32) which corresponds to your application. The **Value** column is used when manually translating subset B and C barcodes into their briefest form.

NOTE: The subset switch start codes, >5, >6, and >7 have two functions. At the beginning of a line, they start manual mode data in subset C, B, or A, respectively. When these codes are used anywhere in the data other than at the start of a line, they are interpreted as the non-ASCII characters in Table 32.

Subset B and C Switching

In the automatic mode, VGL creates the briefest, most compact barcode by automatically switching from subset B to subset C. For example, the data LT436682 could be entered directly into a typed barcode command as ^BNZLT436682^G. VGL automatically selects the appropriate start code, and switches to subset C to compact the continuous numeric data characters (436682).

In the manual mode, however, you must specify the start code and all special function codes to switch subsets. For example, to create the same barcode as generated automatically in the previous paragraph (data of LT436682), the subset B start code is entered, followed by the alpha data (LT), and the subset switch character to switch to subset C is entered followed by the continuous numeric characters. A typical barcode command, in the manual mode, for the data is: ^BNZ>6LT>5Kbr^G. The pairs of continuous numeric

data were manually translated to subset B, data Kbr, corresponding to the subset C values of 436682, respectively, as shown in Table 32. If the data (LT436682) had been entered directly into the barcode command as ^BNZ>6LT>5436682, the barcode generated would have been: Start Code B: LT, subset C: 20 19 22 22 24 18, as determined by the value of the individual data characters in Table 32.

NOTE: If a start code is not entered in the manual mode, VGL provides a subset B start code.

Subset A

Subset A operates in the manual mode only. Subset A data characters include mostly normal printable ASCII characters which require no subset switching and can be entered directly. For example, the data ABC123 in subset A is input in the barcode command as: ^BNZ>7ABC123^. Switching to another subset does not generate a shorter barcode.

Non-printable control characters in subset A can be generated by either: 1) using the subset B lowercase character equivalent from Table 32 (` through o) or 2) using the subset switch characters (>1 through >8, or >SP through >/) from the **Alternate** column of Table 32.

Code 128 Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p* Z *data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] Z [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 31 to print the readable data field in the corresponding font with the specified guard band gap.

Table 31. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :

Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter**:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

Z

The Code 128 type code. Enter **Z**.

ratio

Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**; VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

Code 128 barcodes use eight-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space in dot width, in the following pattern: *1 module wide bar* : *1 module wide space* : *2 module wide bar* : *2 module wide space* : *3 module wide bar* : *3 module wide space* : *4 module wide bar* : *4 module wide space*. For example, enter 22446688 in the ratio data field for:

2 module wide bar
2 module wide space
4 module wide bar
4 module wide space
6 module wide bar
6 module wide space
8 module wide bar
8 module wide space

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable bar/space element relationships for barcode readability. When designing unique ratio data, carefully plot bar/space ratios to conform to readable barcodes.

data	The barcode data. In the automatic mode, whenever a string of 4 or more contiguous numeric digits are detected, VGL inserts a subset C command at the start of the numeric string. When the string of numeric digits is broken, VGL inserts a subset B command. Code 128 encodes from 1 through 40 characters from the character set of the subset code selected. Use the appropriate subset code from the Code 128 Character Set in Table 32. When data is provided in the manual mode, the readable data field is not printed.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Table 32. Code 128 Character Set

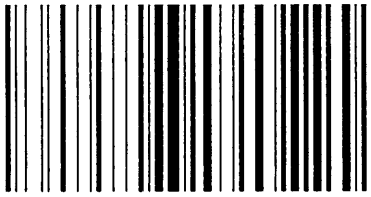
Value	Subset A	Subset B	Subset C	Value	Subset A	Subset B	Subset C	Alternate
0	SP	SP	00	54	V	V	54	
1	!	!	01	55	W	W	55	
2	"	"	02	56	X	X	56	
3	#	#	03	57	Y	Y	57	
4	$	$	04	58	Z	Z	58	
5	%	%	05	59	[	[	59	
6	&	&	06	60	\	\	60	
7	'	'	07	61	]	]	61	
8	(	(	08	62	^	^	62	
9	)	)	09	63	—	—	63	
10	*	*	10	64	NUL	`	64	>SP
11	+	+	11	65	SOH	a	65	>!
12	'	'	12	66	STX	b	66	> "
13	-	-	13	67	ETX	c	67	>#
14	.	.	14	68	EOT	d	68	>$
15	/	/	15	69	ENQ	e	69	>%
16	0	0	16	70	ACK	f	70	>&
17	1	1	17	71	BEL	g	71	>'
18	2	2	18	72	BS	h	72	>(
19	3	3	19	73	HT	i	73	>)
20	4	4	20	74	LF	j	74	>*
21	5	5	21	75	VT	k	75	>+
22	6	6	22	76	FF	l	76	>,
23	7	7	23	77	CR	m	77	>-
24	8	8	24	78	SO	n	78	>.
25	9	9	25	79	SI	o	79	>/
26	:	:	26	80	DLE	p	80	
27	;	;	27	81	DC1	q	81	
28	<	<	28	82	DC2	r	82	
29	=	=	29	83	DC3	s	83	
30	>	>	30	84	DC4	t	84	
31	?	?	31	85	NAK	u	85	
32	@	@	32	86	SYN	v	86	
33	A	A	33	87	ETB	w	87	
34	B	B	34	88	CAN	x	88	
35	C	C	35	89	EM	y	89	
36	D	D	36	90	SUB	z	90	
37	E	E	37	91	ESC	{	91	
38	F	F	38	92	FS	:	92	
39	G	G	39	93	GS	}	93	
40	H	H	40	94	RS	~	94	
41	I	I	41	95	US	DEL	95	>1
42	J	J	42	96	FNC3	FNC3	96	>2
43	K	K	43	97	FNC2	FNC2	97	>3
44	L	L	44	98	SHIFT	SHIFT	98	>4
45	M	M	45	99	CODE C	CODE C	99	>5
46	N	N	46	100	CODE B	FNC4	CODE B	>6
47	O	O	47	101	FNC4	CODE A	CODE A	>7
48	P	P	48	102	FNC1	FNC1	FNC1	>8
49	Q	Q	49					
50	R	R	50	103	START CODE A*			>7
51	S	S	51	104	START CODE B*			>6
52	T	T	52	105	START CODE C*			>5
53	U	U	53					

*Used at the beginning of manual mode commands.

Code 128 Examples

The following command generates the horizontal default ratio Code 128 barcode below in the automatic mode. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,000^KF^**BNZABC123456^G**^*KF^-^PN^-*



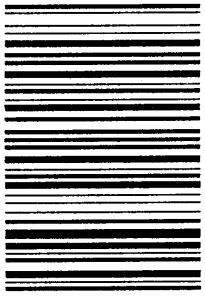
^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for data placement.
^KF activated Dark Print.
^B introduced the barcode command.
N deselected printing the optional readable data field.
Letter Z selected Code 128.
ABC123456 is the barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the Code 128 barcode below in the automatic mode using standard 10 cpi font, double the default ratio, and data of ABC123456. The barcode data begins in subset B and automatically switches to subset C for the numeric data.

^PY^-^M10,10,000^KF^**BY9Z22446688ABC123456^G**^*KF^-^PN^-*

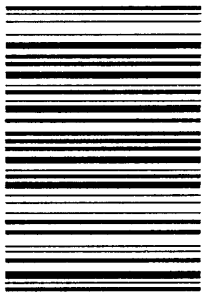
The command below generates the following vertical Code 128 barcode with data of 123@25% in manual mode, subset A.

```
^PY^-^M10,10,000^KF^CNZ>7123@25%^G^KF^-^PN^-
```



The command below generates the same vertical Code 128 barcode in the automatic mode, subset B. Because less than 4 consecutive numeric digits were provided in the data, no subset switching occurred, and the barcode remained in subset B.

```
^PY^-^M10,10,000^KF^CNZ123@25%^G^KF^-^PN^-
```



EAN 8

The EAN 8 barcode is related to the Universal Product Code (UPC) group. EAN 8 can be printed with or without a 2- or 5-digit add-on data field, which is placed at the end of the barcode. The EAN 8 (European Article Number) barcode structure is shown in Figure 10 and described on the following pages.

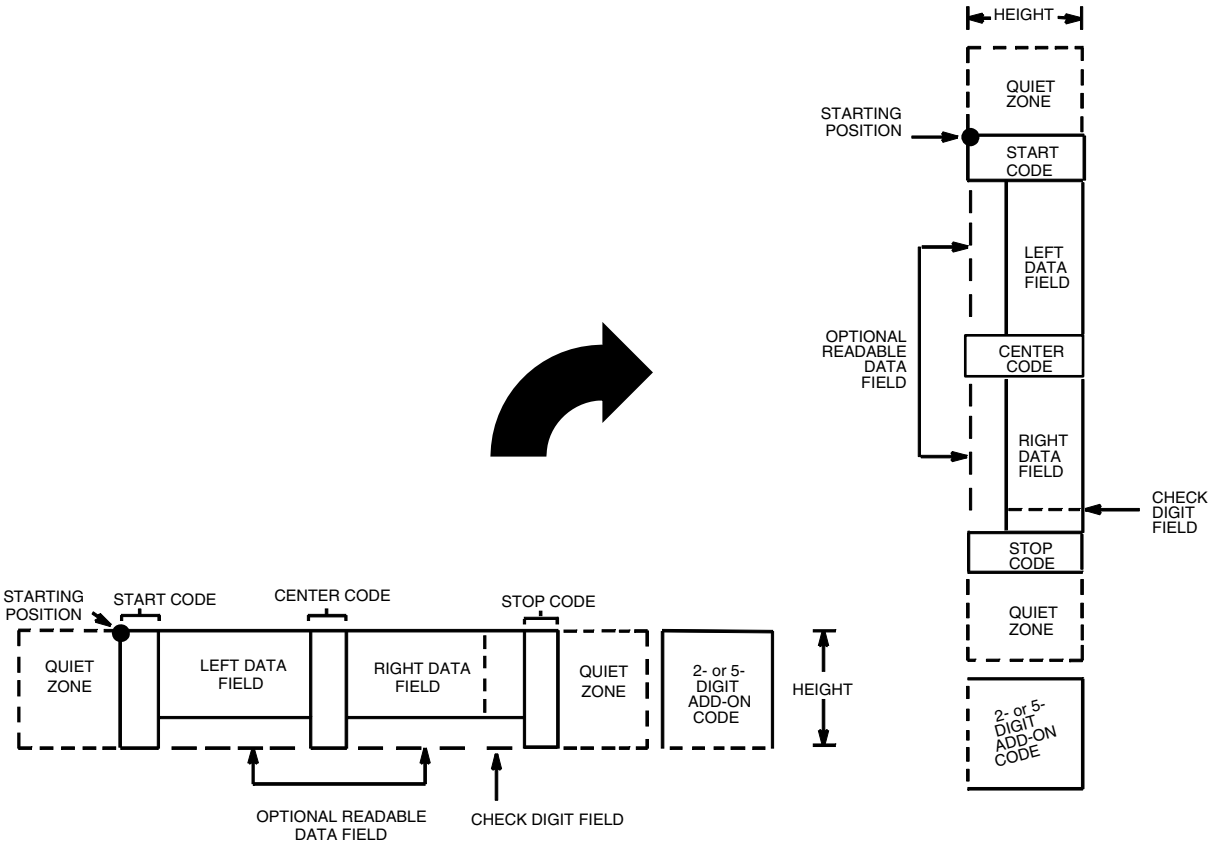


Figure 10. EAN 8 Structure

Quiet Zone

Both ends of the barcode structure have blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones. A trailing quiet zone is provided automatically if an add-on code has been specified in the barcode command.

Start/Center/Stop Codes

The Start/Center/Stop codes are special character codes marking those portions of the barcode. These codes are automatically produced with each barcode.

Data Field

The barcode symbol uses a series of varying width bars and spaces to represent a limited numeric character set (numbers 0-9 and Special Characters Start, Center, and Stop). The bars and spaces vary in width from 1 through 4 modules. Each character consists of 2 bars and 2 spaces that total 7 modules. The symbol coding of the left data field is different from the right data field to permit read direction sensing.

Readable Data

The human readable data field provides a readable interpretation of the barcode data. Barcode data is printed below the horizontal barcode symbol, and to the left of a vertical barcode symbol.

Check Digit

The modulo-10 check digit is automatically calculated and inserted in the barcode symbol. The check digit provides the means to verify accurate scanning.

EAN 8 Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio:	(cc) *dir p type data* (cc)G
Variable Ratio:	(cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G
(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p — Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 33 to print the readable data field in the corresponding font with the specified guard band gap.

Table 33. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or : — Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type — Represents the barcode type. Enter **U** for standard EAN 8; enter **o** (alpha o) for EAN 8 plus a 2-digit add-on data field; enter **p** for EAN 8 plus a 5-digit add-on data field.

ratio Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. However, unique variable ratios for EAN 8 barcodes easily generate large, out-of-spec barcodes. Ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**; VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

EAN 8 barcodes use eight-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *1 module wide bar* : *1 module wide space* : *2 module wide bar* : *2 module wide space* : *3 module wide bar* : *3 module wide space* : *4 module wide bar* : *4 module wide space*.

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable bar/space element relationships for barcode readability. When designing unique ratio data, carefully plot bar/space ratios to conform to readable barcodes.

data The barcode data. Standard EAN 8 barcodes encode exactly 7 digits. The first four data characters are in the left half of the data field, and the last 3 characters are in the right half of the data field. (A check digit is automatically computed and printed at the end of the right data field). If the 2- or 5-digit add-on data field is used, include this data at the end of the data field.

The characters available for the data field are **0** through **9** (hex 30 through 39, respectively).

(cc)G Terminates the barcode command. Enter the SFCC for your VGL configuration followed by any valid command character or **G**, the universal sequence terminator.

EAN 8 Examples

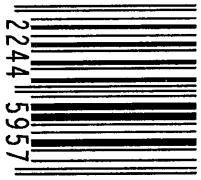
The following command generated the horizontal default ratio EAN 8 barcode below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,000^KF^**BYU2244595^G**^*KF^-^PN^-*

^PY^- turned on the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for data placement.
^KF activated Dark Print.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter U selected the EAN 8 barcode type.
2244595 is the 7-digit barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the vertical EAN 8 barcode below using standard 10 cpi font with the standard default ratio and data of 2244595:

^PY^-^M10,10,000^**CYU2244595^G**^*PN^-*



EAN 13

The EAN 13 barcode is related to the Universal Product Code (UPC) group. EAN 13 can be printed with or without a 2- or 5-digit add-on data field, which is placed at the end of the barcode. The EAN 13 (European Article Number) barcode structure is shown in Figure 11 and described on the following pages.

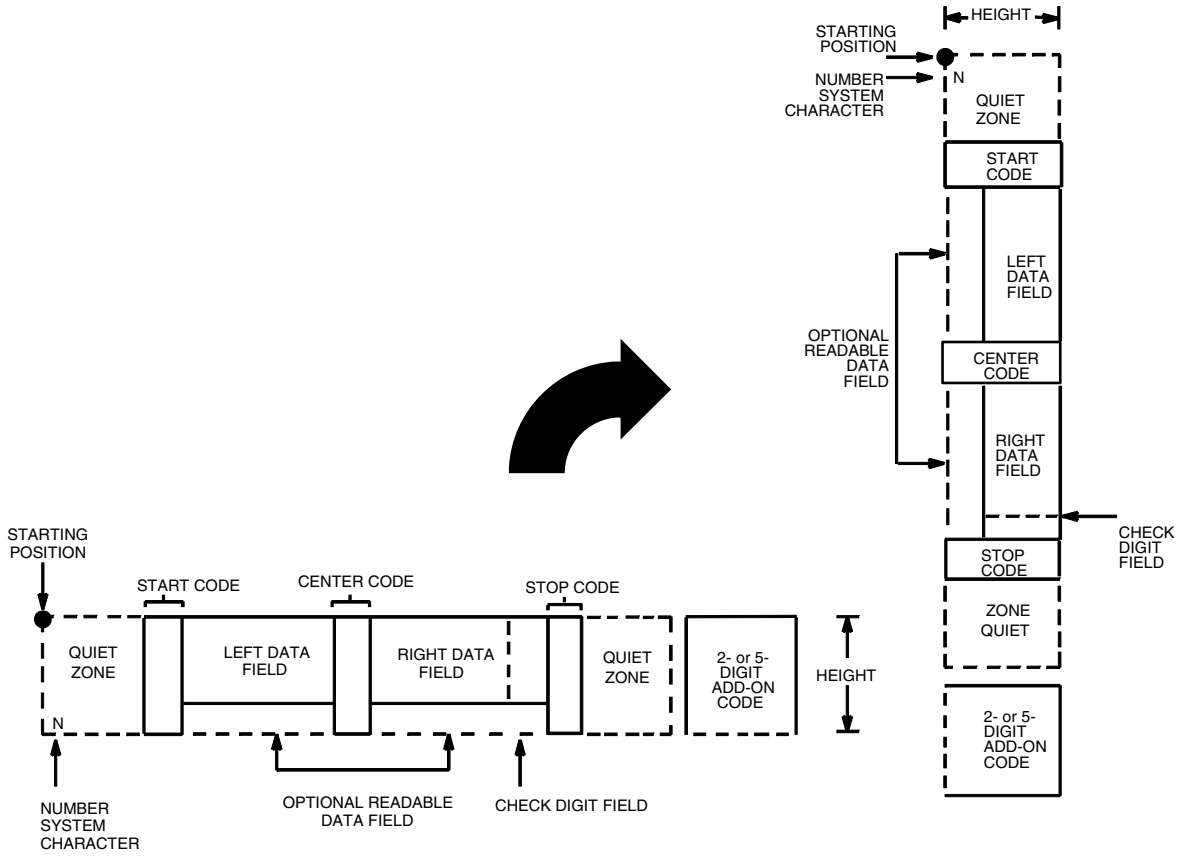


Figure 11. EAN 13 Structure

Quiet Zone

Quiet zones extend on both ends of the barcode to permit the code to begin and end in a blank area. You are responsible for providing sufficient space on the form for the quiet zones. A trailing quiet zone is provided automatically if an add-on code has been specified in the barcode command.

Start/Center/Stop Codes

The Start/Center/Stop codes are special character codes marking those portions of the barcode. These codes are automatically produced with each barcode.

Number System Character

The number system character field allows you to apply a code to a class or type of item. The first character in the data field is used as the number system character; it is printed in the left quiet zone.

Data Field

The barcode symbol uses a series of varying width bars and spaces to represent a limited character set (numbers 0-9 and Special Characters Start, Center, and Stop). The bars and spaces vary in width from 1 through 4 modules. Each character consists of 2 bars and two spaces that total 7 modules. The symbol coding of the left data field is different from the right data field to permit read direction sensing.

Readable Data

The human readable data field provides a readable interpretation of the barcode data. Barcode data is printed below the horizontal barcode symbol and to the left of a vertical barcode symbol.

Check Digit

The modulo-10 check digit is automatically calculated and inserted in the barcode symbol. The check digit provides the means to verify accurate scanning. The number system character is included in the check digit algorithm.

EAN 13 Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p type data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 34 to print the readable data field in the corresponding font with the specified guard band gap.

Table 34. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :

Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type

Represents the barcode type. Enter **T** for standard EAN 13; enter **m** for EAN 13 plus a 2-digit add-on data field; enter **n** for EAN 13 plus a 5-digit add-on data field.

ratio

Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. However, unique variable ratios for EAN 13 barcodes easily generate large, out-of-spec barcodes. Ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**; VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

EAN 13 barcodes use eight-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *1 module wide bar* : *1 module wide space* : *2 module wide bar* : *2 module wide space* : *3 module wide bar* : *3 module wide space* : *4 module wide bar* : *4 module wide space*.

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable bar/space element relationships for barcode readability. When designing unique ratio data, carefully plot bar/space ratios to conform to readable barcodes.

data	The barcode data. EAN 13 barcodes encode exactly 12 digits. The first character input is interpreted as the number system character. (A barcode character is not produced for the number system character.) The next six characters are the left side (the upper side on vertically oriented symbols). The final five characters are the right side (or the lower side on vertically oriented symbols). A thirteenth character is an automatic check digit which is computed and printed in the last character position in the right data field. If the 2- or 5-digit add-on data field is used, include this data at the end of the data field. The characters available for the data field are **0** through **9** (hex 30 through 39).
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

EAN 13 Examples

The following command generated the horizontal default ratio EAN 13 barcode below. In the command sequence, graphics mode data is *italicized*, and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

*^PY^-^M10,10,000^KF^***BYT123456123456^G^***KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for data placement.
^KF activated Dark Print.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter T selected the EAN 13 barcode type.
123456123456 is the 12-digit barcode data.

^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the vertical EAN 13 barcode below using standard 10 cpi font with the standard default ratio and data of 123456123456:

^PY^-^M10,10,000^KF^**CYT123456123456**^**G***^KF^-^PN^-*

German Interleaved 2/5

The German Interleaved 2/5 barcode structure is shown in Figure 12 and described on the following pages.

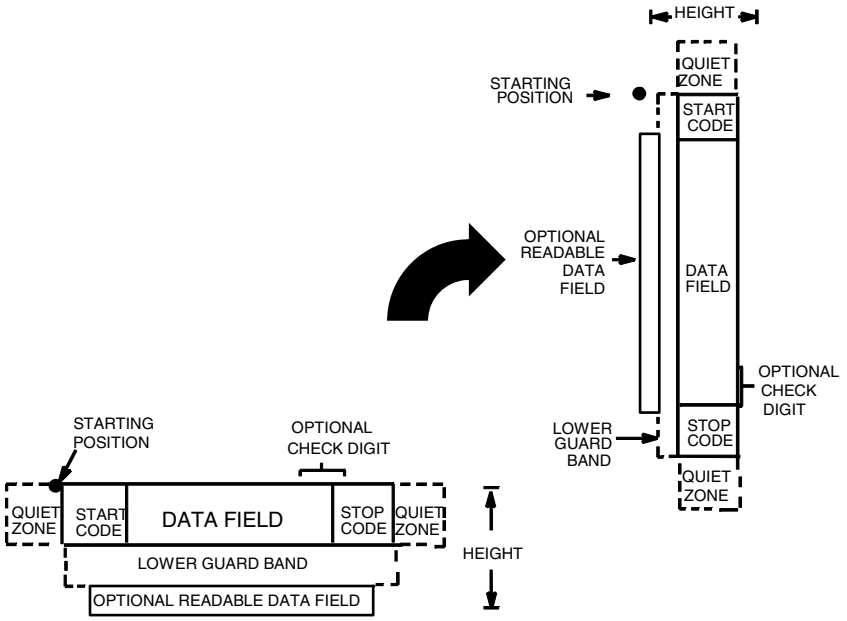


Figure 12. German Interleaved 2/5 Structure

Quiet Zone

Both ends of the barcode structure have blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

Unique start and stop codes permit bidirectional scanning. Both start and stop codes contain bars and spaces. They are automatically produced.

Data Field

The barcode symbol uses a series of wide and narrow bars and spaces to represent numeric characters. The structure is 2 wide elements (bars or spaces) and 3 narrow elements. In the barcode, two characters are interleaved (paired); bars are used to represent data characters occupying the odd-numbered positions, and spaces are used to represent data characters occupying the even-numbered positions.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. Bbarcodearcode data is printed below the horizontal barcode symbol and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected.

Check Digit

The modulo-10 check digit is automatically calculated and inserted in the barcode symbol. The check digit provides the means to verify accurate scanning.

German Interleaved 2/5 Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p type data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 35 to print the readable data field in the corresponding font with the specified guard band gap.

Table 35. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or : Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type Represents the barcode type. Select one of the German Interleaved 2/5 barcode type codes shown in Table 36.

Table 36. German Interleaved 2/5 Barcodes

Standard Type Code	IBARC, Type Code	# of Data Characters	Check Digits	Default Bar/ Space Ratios*
V	POSTAGI**	11	Mod 10	4:6:14:16
W	POSTAGL	13	Mod 10	4:6:14:16

*Ratios represent dot width of the bar/space elements as follows: *Narrow Bar : Narrow Space : Wide Bar : Wide Space*.
**The last character of this type command is the uppercase “i” character (hex 49), not to be confused with a lowercase “L” character (hex 6C).

ratio Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**. VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

German Interleaved 2/5 barcodes use four-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *narrow bar* : *narrow space* : *wide bar* : *wide space*. For example, enter 2266 in the ratio parameter for:

2 dot-wide narrow bar
2 dot-wide narrow space
6 dot-wide wide bar
6 dot-wide wide space

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. For example, VGL accepts wide/narrow ratio values of 2 and 5, respectively; however a narrow element larger than the wide element produces an unreadable barcode. When designing unique ratio data, carefully plot wide and narrow ratios to conform to readable barcodes.

data	The barcode data. German Interleaved 2/5 encodes either 11 or 13 characters. The characters available for the data field are **0** through **9** (hex 30 through 39).
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

German Interleaved 2/5 Examples

The following command generates the horizontal default ratio German Interleaved 2/5 barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

*^PY^-^M10,10,000^KF^***BTV01853624568^G^***KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for data placement.
^KF activated Dark Print.
^B introduced the barcode command.
T selected the .1-inch OCR-B font to print the optional readable data field.
Letter V selected the 11-digit German Interleaved 2/5 with the default 4:6:14:16 ratio.
01853624568 is the barcode data.
^G terminated the barcode command sequence.

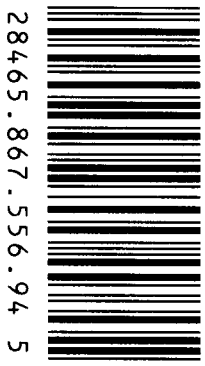
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the 11-digit horizontal German Interleaved 2/5 barcode below using standard font, the default ratio, and data of 10518475232:

*^PY^-^M05,05,000^KF^***IBARC,POSTAGI,B,10518475232^G***^KF^-^PN^-*

The following command generated the 13-digit vertical German Interleaved 2/5 barcode below using the .1-inch OCR-B font, the default ratio, and data of 2846586755694:

*^PY^-^M10,10,000^KF^***CTW2846586755694^G***^KF^-^PN^-*



GS1-128

NOTE: GS1-128 is formerly known as UCC/EAN-128.

The UCC/EAN-128 structure is shown in Figure 13 and described on the following pages.

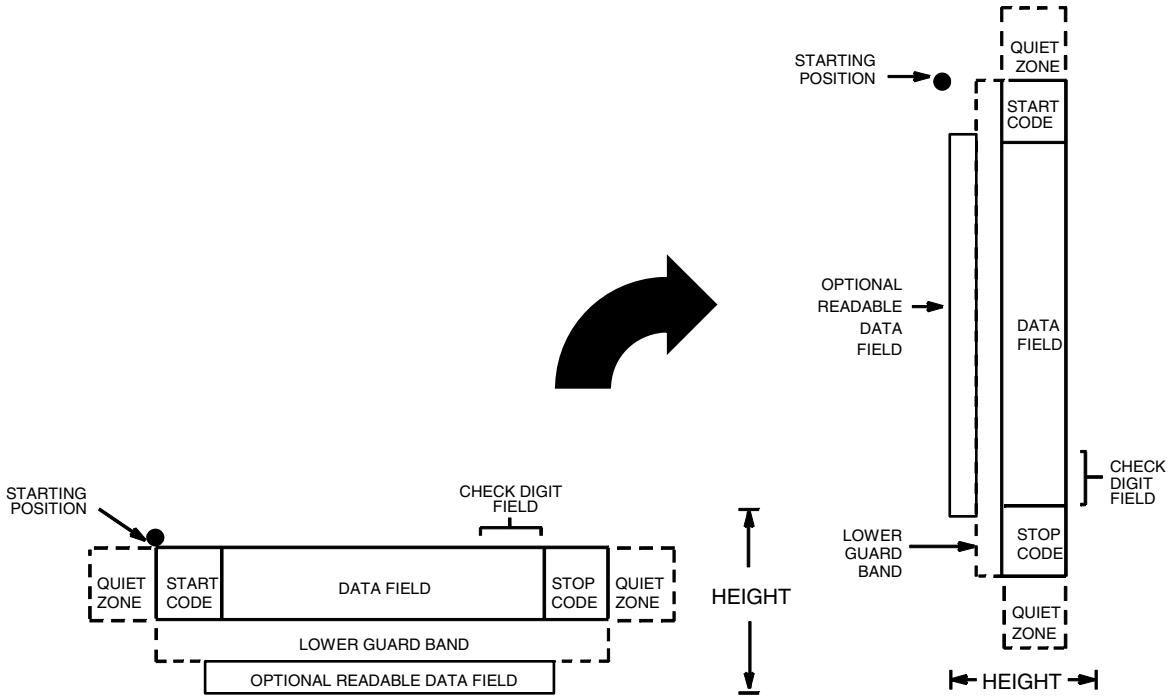


Figure 13. UCC/EAN-128 Structure

UCC/EAN-128 uses the same barcode and character set as Code 128. However, in UCC/EAN-128, the Function 1 character FNC1 immediately follows the start code. The FNC1 character has been reserved exclusively for UCC/EAN-128.

The UCC/EAN-128 data structure requires an Application Identifier (AI) at the beginning of barcode data. Each AI determines the format and length of the data which follows. See Table 37 for more detail.

Table 37. UCC/EAN-128 Application Identifiers

Application Identifier (AI)	Content	Format
00	Serial Shipping Container Code	n2+n18
02	Item Num. of Goods Within Another Unit	n2+n14
10	Batch or Lot Number	n2+an..20
11 (*)	Production Date (YYMMDD)	n2+n6
13 (*)	Packaging Date (YYMMDD)	n2+n6
15 (*)	Sell By Date (Quality) (YYMMDD)	n2+n6
17 (*)	Expiration Date (Safety) (YYMMDD)	n2+n6
20	Product Variant	n2+n2
21	Serial Number	n2+an..20
22	HIBCC = Quantity, Date, Batch and Link	n2+an..29
23 (**)	Lot Number (Transitional Use)	n3+n..19
240	Additional Product ID Assigned By Manufacturer	n3+an..30
250	Secondary Serial Number	n3+an..30
30	Quantity	n2+n..8
310 (***)	Net Weight, Kilograms	n4+n6
311 (***)	Length or 1st Dimension, Meters	n4+n6
312 (***)	Width, Diameter or 2nd Dimension, Meters	n4+n6
313 (***)	Depth, Thickness, Height or 3rd Dimension, Meters	n4+n6
314 (***)	Area, Square Meters	n4+n6
315 (***)	Volume, Liters	n4+n6
316 (***)	Volume, Cubic Meters	n4+n6
320 (***)	Net Weight, Pounds	n4+n6
321 (***)	Length Or 1st Dimension, Inches	n4+n6
322 (***)	Length Or 1st Dimension, Feet	n4+n6
323 (***)	Length Or 1st Dimension, Yards	n4+n6
324 (***)	Width, Diameter, or 2nd Dimension, Inches	n4+n6
325 (***)	Width, Diameter, or 2nd Dimension, Feet	n4+n6
326 (***)	Width, Diameter, or 2nd Dimension, Yards	n4+n6
327 (***)	Depth, Thickness, Height, or 3rd Dimension, Inches	n4+n6
328 (***)	Depth, Thickness, Height, or 3rd Dimension, Feet	n4+n6
329 (***)	Depth, Thickness, Height, or 3rd Dimension, Yards	n4+n6
330 (***)	Gross Weight-Kilograms	n4+n6
331 (***)	Length or 1st Dimension, Logistics	n4+n6
332(***)	Width, Diameter, or 2nd Dimension, Meters, Logistics	n4+n6
333 (***)	Depth, Thickness, Height or 3rd Dimension, Meters, Logistics	n4+n6

Table 37. UCC/EAN-128 Application Identifiers (continued)

Application Identifier (AI)	Content	Format
334 (***)	Area, Square Meters, Logistics	n4+n6
335 (***)	Gross Volume, Liters	n4+n6
336 (***)	Gross Volume, Cubic Meters	n4+n6
337 (***)	Kilograms Per Square Meter	n4+n6
340 (***)	Gross Weight, Pounds	n4+n6
341 (***)	Length Or 1st Dimension, Inches, Logistics	n4+n6
342 (***)	Length Or 1st Dimension, Feet, Logistics	n4+n6
343 (***)	Length Or 1st Dimension, Yards, Logistics	n4+n6
344 (***)	Width, Diameter, or 2nd Dimension, Inches, Logistics	n4+n6
345 (***)	Width, Diameter, or 2nd Dimension, Feet, Logistics	n4+n6
346 (***)	Width, Diameter, or 2nd Dimension, Yards, Logistics	n4+n6
347 (***)	Depth, Thickness, Height or 3rd Dimension, Inches, Logistics	n4+n6
348 (***)	Depth, Thickness, Height or 3rd Dimension, Feet, Logistics	n4+n6
349 (***)	Depth, Thickness, Height or 3rd Dimension, Yards, Logistics	n4+n6
350 (***)	Area, Square Inches	n4+n6
351 (***)	Area, Square Feet	n4+n6
352 (***)	Area, Square Yards	n4+n6
353 (***)	Area, Square Inches, Logistics	n4+n6
354 (***)	Area, Square Feet, Logistics	n4+n6
355 (***)	Area, Square Yards, Logistics	n4+n6
356 (***)	Net Weight, Troy Ounce	n4+n6
357 (***)	Net Volume, Ounces	n4+n6
360 (***)	Volume, Quarts	n4+n6
361 (***)	Volume, Gallons	n4+n6
362 (***)	Gross Volume, Quarts	n4+n6
363 (***)	Gross Volume, Gallons	n4+n6
364 (***)	Volume, Cubic Inches	n4+n6
365 (***)	Volume, Cubic Feet	n4+n6
366 (***)	Volume, Cubic Yards	n4+n6
367 (***)	Gross Volume, Cubic Inches	n4+n6
368 (***)	Gross Volume, Cubic Inches	n4+n6
369 (***)	Gross Volume, Cubic Inches	n4+n6
37	Quantity of Units Contained (For Use With AI 02 Only)	n2+n..8
400	Customer's Purchase Order Number	n3+an..30
401	Consignment Number	n3+an..30
410	Ship To (Deliver To) Location Code Using EAN-13	n3+n13

Table 37. UCC/EAN-128 Application Identifiers (continued)

Application Identifier (AI)	Content	Format
411	Bill To (Invoice To) Location Code Using EAN-13	n3+n13
412	Purchase From (Location Code of Party From Whom Goods Are Purchased)	n3+n13
413	Ship For UCC/EAN Location Code	n3+n13
414	EAN Location Code For Physical Identification	n3+n13
420	Ship To (Deliver To) Postal Code Within a Single Postal Authority	n3+an..20
421	Ship To (Deliver To) Postal Code With 3-Digit ISO Country Code Prefix	n3+n3+an..9
8001	Roll Products-Width, Length, Core Diameter, Direction and Splices	n4+n14
8003	UPC/EAN Number and Serial Number Or Returnable Asset	n4+n14+an..16
8004	UCC/EAN Serial Identification	n4+an..30
8005	Identifies the Price Per Unit of Measure	n4+n6
8006	Component of an Article	n4+n14+n2+n2
8018	Service Relation Number	n4+n18
8100	Coupon Extended Code-Number System Character and Offer	n4+n1+n5
8101	Coupon Extended Code-Number System Character, Offer and End of Offer	n4+n1+n5+n4
8102	Coupon Extended Code-Number System Character Preceded by Zero	n4+n1+n1
90	Mutually Agreed, Between Trading Partners	n2+an..30
91	Intra-Company (Internal)	n2+an..30
92	Intra-Company (Internal)	n2+an..30
93	Intra-Company (Internal)	n2+an..30
94	Intra-Company (Internal)	n2+an..30
95	Internal-Carriers	n2+an..30
96	Internal-Carriers	n2+an..30
97	Intra-Company (Internal)	n2+an..30
98	Intra-Company (Internal)	n2+an..30
99	Internal	n2+an..30

(*)To indicate only year and month, DD must be filled with “00”
(**) Plus one digit for length indication
(***) Plus one digit for decimal point indication

Data Value Representation:

a - alphabetic characters
an - alpha-numeric characters
an..3 - up to 3 alpha-numeric characters
n - numeric characters
n3 - 3 numeric characters, fixed length
n..3 - up to 3 numeric characters

Quiet Zone

Both ends of the barcode structure require blank quiet zones. The quiet zones must be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You must provide sufficient space on the form for the quiet zones.

Start/Stop Codes

The start and stop codes identify the leading and trailing ends of the barcode. UCC/EAN-128 uses unique start codes for character subsets B and C, and a stop code common to both. An automatic mode switching feature is used to generate the correct start code based on the first four data field characters.

Data Field

UCC/EAN-128 barcodes require a special character called “Function 1” (FNC1) to immediately follow the start code. VGL automatically supplies this character, so it must not be included in the data field by the user.

A character is made up of three bars and three spaces, each varying in width from 1 through 4 modules, for a total of eleven modules. The number of modules making up the bars is even. The stop code has four bars and is 13 modules wide.

The character set for UCC/EAN-128 is the same as the character set for Code 128. Refer to the Code 128 Character Set (Table 32). Every character is interpreted according to the currently active character subset. UCC/EAN-128 uses subset B and subset C only. Subset B, shown in Table 32, includes all standard alphanumeric keyboard characters, lowercase alphabetical characters, and special characters. Subset C interprets the characters as pairs of numbers 00 through 99, along with some special characters, as shown in Table 32. The start code or subset switch code determines whether a particular barcode character is decoded as one character or as a pair of numbers.

Readable Data

The optional printed data field (PDF) provides a human-readable interpretation of the barcode data. When the printed data field is enabled by use of the “PDF” parameter, the overall height of the bars is reduced to make room for a guard band and the human-readable characters. The printed data field is formatted with spaces or parentheses denoting particular data fields such as the application identifier. Special characters such as start, stop, subset switch, modulo-103 check digit, and FNC1 do not appear in the human-readable data.

Refer to Figure 13. Using Level I syntax ^B (horizontal) or ^C (vertical clockwise rotation), the readable data appears below the barcode, reading in the direction of start code towards stop code. Using Level II syntax (^IBARC), the barcode may be oriented with any of the graphics commands ^M, ^V, ^U, or ^E; and the human-readable data may be positioned above or below the bars, still reading in the direction of start code towards stop code.

Modulo-103 Check Digit

A modulo-103 check digit is automatically calculated and inserted in the barcode symbol immediately in front of the stop code, in the same manner as the Code 128 barcode. The check digit verifies accurate scanning. The start code is included in the check digit algorithm. The modulo-103 check digit is not displayed in the readable data field.

Modulo-10 Data Field Check Digit for SSCC-18 and SCC-14

AI 00 (called the Serial Shipping Container Code, or SSCC-18) takes eighteen additional numerical data bytes. The last data byte is a modulo-10 check digit on the preceding seventeen data bytes. Counting the two zeros of the application identifier, the modulo-10 check digit is the twentieth byte in the data field.

AI 01 (called the Shipping Container Code, or SCC-14) takes fourteen additional numerical data bytes. The last data byte is a modulo-10 check digit on the preceding thirteen data bytes. Counting the zero and the one of the application identifier, the modulo-10 check digit is the sixteenth byte in the data field.

The modulo-10 data field check digit for both SSCC-18 and SCC-14 is printed in the barcode as the second half of the last number pair using subset C. It is displayed in the human-readable data field as the twentieth byte for SSCC-18 or the sixteenth byte for SCC-14.

VGL automatically calculates the modulo-10 check digit for SSCC-18 if only 17 data digits are provided following the application identifier of 00.

UCC/EAN-128 Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p* q *data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] q [*ratio*] *data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.
p	Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode. Replace *p* in the barcode command with one of the codes listed in Table 38 to print the readable data field in the corresponding font with the specified guard band gap.

Table 38. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :

Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

q

The type code for UCC/EAN-128. Enter **q**.

ratio

Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**; VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

UCC/EAN-128 barcodes use eight-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space in dot width, in the following pattern: *1 module wide bar* : *1 module wide space* : 2 *module wide bar* : *2 module wide space* : *3 module wide bar* : *3 module wide space* : 4 *module wide bar* : *4 module wide space*. For example, enter 22446688 in the ratio data field for:

2 module wide bar
2 module wide space
4 module wide bar
4 module wide space
6 module wide bar
6 module wide space
8 module wide bar
8 module wide space

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable bar/space element relationships for barcode readability. When designing unique ratio data, carefully plot bar/space ratios to conform to readable barcodes.

data	The barcode data. In the automatic mode, whenever a string of 4 or more contiguous numeric digits are detected, VGL inserts a subset C command at the start of the numeric string. When the string of numeric digits is broken, VGL inserts a subset B command. Code 128 encodes from 1 through 40 characters from the character set of the subset code selected. UCC/EAN-128 must have exactly 19 digits. Use the appropriate subset code from the Code 128 Character Set in Table 32. When data is provided in the manual mode, readable data field is not printed.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

UCC/EAN-128 Examples

The following command generates the horizontal default ratio UCC/EAN-128 barcode below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^- ^M10,10,000^**BYq00345678901234567 89**^**G**^-*^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for data placement.
^B introduced the barcode command.
Y selected printing the optional readable data field.
Letter q selected UCC/EAN-128.
The barcode data is 0034567890123456789.
^G terminated the barcode command sequence.
^PN^- terminated the graphics mode.

The following command generated the UCC/EAN-128 barcode below using variable target dot ratio and data of 0034567890123456789.

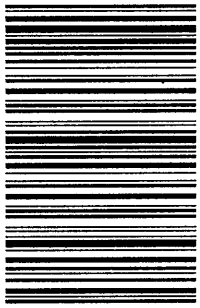
```
^PY^-^M10,10,000^IBARC,UCC128,RD2:4:5:7:8:10:11:13,N,
0034567890123456789^G^-^PN^-
```

The command below generates the following vertical UCC/EAN-128 barcode with data of 0034567890123456789.

```
^PY^-^V05,05,300^IBARC,UCC128,B,0034567890123456789^G-^PN^-
```

The command below generates the same vertical UCC/EAN-128 barcode using target dot variable ratios with the Version I syntax.

```
^PY^-^M10,10,300^CN:q24578ABD0034567890123456789^G-^PN^-
```

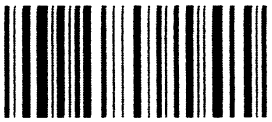


The program below illustrates the use of dynamic forms to generate part of a shipping form with three UCC/EAN-128 barcodes. An internal code (AI = 91) is used as a store number, a ship-to-postal (AI = 420) gives the customer ZIP Code as dynamic data, and a serial shipping container code (AI = 00) is also given as dynamic data. In this example, since the application identifiers are known, they are given as static data, and only the data field for each variable AI is made dynamic. The ship-to-postal takes a five digit ZIP Code; the SSCC-18 takes seventeen digits with VGL creating the modulo-10 data field check digit automatically.

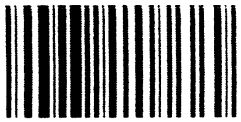
```
^PY^-^F^-
^B^-
^M0101000
^X titles using compressed print ^A
^T0010^J000^S4SHIP TO POSTAL CODE
^T0010^J170^S4STORE
^T0010^J340^S4SSCC-18
^X EAN/UCC 128 barcodes ^A
^M0808^T0030^J020^KF^BYq420^[005^G^KF
^M0808^T0030^J190^KF^BYq911528^G^KF
^M1208^T0030^J360^KF^BYq00^[017^G^KF
^-
^,^-
^]
92614
34567890123456789

^G^-
^,^-
^O^-^PN^-
```

SHIP TO POSTAL CODE



STORE



SSCC-18

GS-1 Data Matrix

NOTE: GS-1 Datamatrix is formerly known as Datamatrix.

Data Matrix is a two-dimensional barcode containing small dark and light square data modules. It has a finder pattern of two solid lines and two alternating dark and light lines on its perimeter. This barcode is capable of storing up to 3116 numeric digits or 2335 alphanumeric characters in a symbol 144 modules square. It is also capable of encoding in a number of different schemes.

Two main subsets for Data Matrix exist, which differ in terms of error correction. The first subset uses ECC-000 through ECC-140 and uses convolution coding for error correction. The second subset is ECC-200, which uses Reed-Solomon error correction techniques. ECC-200 format is recommended.

Quiet Zone

The minimum quiet zone is one module width on all four sides.

Readable Data

There is no printable data field allowed for the Data Matrix barcode.

Data Field

The data allowed within the data field depends on the error correction subset you are using. See the *data* description on page 231 for details.

Data Matrix Command Format

Default Ratio: (cc) *dir* N M [X[D]*n*] [C*n*] [R*n*] [E*n*] [I*n*], *data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.
N	Enter **N** to turn off the readable data field.
M	The Data Matrix type code. Enter **M**.
X[D]*n*	Optional parameter which designates the x-dimension width of a single square data module in dots (60 x 72 dpi), or printer dots if the **D** parameter is used. For *n*, enter a value from **1** through **255** to represent the dot number.
C*n*	Optional parameter that sets the number of columns in the symbol. A value of **0** (the default) automates this process. See Table 42 through Table 48 for the combination of columns and rows allowed and the maximum amount of data that can be encoded.

R*n*	Optional parameter that specifies the number of rows in the symbol. A value of **0** (the default) automates this process. See Table 42 through Table 48 for the combination of columns and rows allowed and the maximum amount of data that can be encoded.
E*n*	Optional parameter that specifies the error correction level. Enter **E**, then one of the following values: **0**, **50**, **80**, **100**, **140**, or **200**. Levels 0 through 140 use increasing levels of convolutional error coding. Level 200 (the default) uses Reed-Solomon block error correction and is the recommended level of error correction.
I*n*	Optional parameter that specifies the format ID. This field only has meaning for ECC-000 through ECC-140 and is ignored for ECC-200. This specifies the type of data that is encoded in the symbol. Enter **I**, then a value from **1** through **6**. The default value is 3. Table 39 shows the type of data encoded for the various format IDs.
,	Enter a comma (**,**) to separate the data field from the previous field. The comma is required.
data	For ECC-000 through ECC-140, the data allowed within the data field depends on the format ID parameter. The allowed data for these ECC types are given in Table 39. For Format ID #5 which accepts control characters and Format ID #6 which accepts codes greater than 127, you can enter these values using a SO character followed by an identifier. When encoding special characters, you must enter a SO character followed by at least one other identifier and its field (i.e., ASCII 254 = ^d254). This is only considered to be one character, even though the data field holds 5 characters (^d254). If you intend to code the SO character by itself (no special encoding), then the SO character should be followed by another SO character. Table 40 illustrates how to use these special characters.

Table 39. Data Field for ECC-000 through ECC-140

Format ID #	Data
1	Numeric 0-9, Space
2	Uppercase A-Z, Space
3	Uppercase A-Z, Numeric 0-9, Space
4	Uppercase A-Z, Numeric 0-9, Space, Period, Comma, Minus, Forward Slash
5	Full 128 ASCII set (0-127)
6	User defined (0-255)

For ECC-200, format ID has no meaning and is ignored. Instead, you can enter data of any type (ASCII 0-255) and it will be automatically optimized into the proper encoding scheme. See the “Special Characters Using SO” section for examples of methods to enter special characters such as FNC1 into the data stream.

The maximum number of data depend on three factors: (1) size of the matrix, (2) ECC level, and (3) type of data. The size of the matrix is automatically chosen by VGL unless the parameters of row and/or column are supplied (see C*n* and R*n* parameters). The maximum number of data can then be found by finding the proper table based on ECC type. For each different valid matrix combination, the maximum number of data are given for numeric, alphanumeric, and full 8-byte data. You do not have to enter the maximum; a pad character is automatically inserted into the barcode when necessary.

(cc)G Terminates the barcode command. Enter the SFCC for your VGL configuration followed by any valid command character or **G**, the universal sequence terminator.

Special Characters Using SO

Table 40 and Table 41 illustrate the methods of encoding special characters, and shows the special characters supported. These special characters are identified by using SO. The default value for the SO character is hex 0E, but this value can be changed using the printer's front panel (see *User's Manual* for details). Examples are given with the SO character represented by "^" for clarity.

Table 40. Special Character Encoding (All ECC Levels)

Special Characters	Method	Example
Control Characters 0-31	<SO> + @ ... <SO> + _	NUL = ^@, BEL = ^G
Any ASCII value 0 - 255	<SO> + **d** + 3 digit	ASCII 10 = ^d010
ASCII value SO	<SO> + <SO>	^^

Table 41. Special Character Encoding (ECC-200 Only)

Special Characters	Method	Example
FNC1	<SO> + **1**. If FNC1 is 2nd codeword, previous data must be **A-Z**, **a-z**, or **01-99**	01^1<Data>
Structured Append	<SO> + **2** + 3 digit number representing symbol sequence and file identifier	^2042<File ID>
Reader Programming	<SO> + **3** Must be first in the data field	^3<Data>
MH10.8.3 Abbreviated Format 05 Header	<SO> + **5** Must be first in the data field	^5<Data>
MH10.8.3 Abbreviated Format 06 Header	<SO> + **6** Must be first in the data field	^6<Data>
Extended Channel Interpretation	<SO> + **7** + 6 digit EC (000000-999999)	^7112233<Data>

Symbol Characteristics

The following tables illustrate the maximum data capacities for the Data Matrix barcode as a function of symbol size (column x row) and data type. Note that all ECC-000 through ECC-140 symbols are square and always have an odd number of rows and columns. ECC-200 symbols have square or rectangular sizes and have an even number of rows and columns.

Table 42. ECC-000 Characteristics

(Row x Column)	Maximum Numeric	Maximum Alphanumeric	Maximum 8-Byte Data
9 X 9	3 characters	2 characters	1 character
11 X 11	12 characters	8 characters	5 characters
13 X 13	24 characters	16 characters	10 characters
15 X 15	37 characters	25 characters	16 characters
17 X 17	53 characters	35 characters	23 characters
19 X 19	72 characters	48 characters	31 characters
21 X 21	92 characters	61 characters	40 characters
23 X 23	115 characters	76 characters	50 characters
25 X 25	140 characters	93 characters	61 characters
27 X 27	168 characters	112 characters	73 characters
29 X 29	197 characters	131 characters	86 characters
31 X 31	229 characters	153 characters	100 characters
33 X 33	264 characters	176 characters	115 characters
35 X 35	300 characters	200 characters	131 characters
37 X 37	339 characters	226 characters	148 characters
39 X 39	380 characters	253 characters	166 characters
41 X 41	424 characters	282 characters	185 characters
43 X 43	469 characters	313 characters	205 characters
45 X 45	500 characters	345 characters	226 characters
47 X 47	560 characters	378 characters	248 characters
49 X 49	596 characters	413 characters	271 characters

Table 43. ECC-050 Characteristics

(Row x Column)	Maximum Numeric	Maximum Alphanumeric	Maximum 8-Byte Data
11 X 11	1 character	1 character	not supported
13 X 13	10 characters	6 characters	4 characters
15 X 15	20 characters	13 characters	9 characters
17 X 17	32 characters	21 characters	14 characters
19 X 19	46 characters	30 characters	20 characters
21 X 21	61 characters	41 characters	27 characters
23 X 23	78 characters	52 characters	34 characters
25 X 25	97 characters	65 characters	42 characters
27 X 27	118 characters	78 characters	51 characters
29 X 29	140 characters	93 characters	61 characters
31 X 31	164 characters	109 characters	72 characters
33 X 33	190 characters	126 characters	83 characters
35 X 35	217 characters	145 characters	95 characters
37 X 37	246 characters	164 characters	108 characters
39 X 39	277 characters	185 characters	121 characters
41 X 41	310 characters	206 characters	135 characters
43 X 43	344 characters	229 characters	150 characters
45 X 45	380 characters	253 characters	166 characters
47 X 47	418 characters	278 characters	183 characters
49 X 49	457 characters	305 characters	200 characters

Table 44. ECC-080 Characteristics

(Row x Column)	Maximum Numeric	Maximum Alphanumeric	Maximum 8-Byte Data
13 X 13	4 characters	3 characters	2 characters
15 X 15	13 characters	9 characters	6 characters
17 X 17	24 characters	16 characters	10 characters
19 X 19	36 characters	24 characters	16 characters
21 X 21	50 characters	33 characters	22 characters
23 X 23	65 characters	43 characters	28 characters
25 X 25	82 characters	54 characters	36 characters
27 X 27	100 characters	67 characters	44 characters
29 X 29	120 characters	80 characters	52 characters
31 X 31	141 characters	94 characters	62 characters
33 X 33	164 characters	109 characters	72 characters
35 X 35	188 characters	125 characters	82 characters
37 X 37	214 characters	143 characters	94 characters
39 X 39	242 characters	161 characters	106 characters
41 X 41	270 characters	180 characters	118 characters
43 X 43	301 characters	201 characters	132 characters
45 X 45	333 characters	222 characters	146 characters
47 X 47	366 characters	244 characters	160 characters
49 X 49	402 characters	268 characters	176 characters

Table 45. ECC-100 Characteristics

(Row x Column)	Maximum Numeric	Maximum Alphanumeric	Maximum 8-Byte Data
13 X 13	1 character	1 character	not supported
15 X 15	8 characters	5 characters	3 characters
17 X 17	16 characters	11 characters	7 characters
19 X 19	25 characters	17 characters	11 characters
21 X 21	36 characters	24 characters	15 characters
23 X 23	47 characters	31 characters	20 characters
25 X 25	60 characters	40 characters	26 characters
27 X 27	73 characters	49 characters	32 characters
29 X 29	88 characters	59 characters	38 characters
31 X 31	104 characters	69 characters	62 characters
33 X 33	121 characters	81 characters	53 characters
35 X 35	140 characters	93 characters	61 characters
37 X 37	159 characters	106 characters	69 characters
39 X 39	180 characters	120 characters	78 characters
41 X 41	201 characters	134 characters	88 characters
43 X 43	224 characters	149 characters	98 characters
45 X 45	248 characters	165 characters	108 characters
47 X 47	273 characters	182 characters	119 characters
49 X 49	300 characters	200 characters	131 characters

Table 46. ECC-140 Characteristics

(Row x Column)	Maximum Numeric	Maximum Alphanumeric	Maximum 8-Byte Data
17 X 17	2 characters	1 character	1 character
19 X 19	6 characters	4 characters	3 characters
21 X 21	12 characters	8 characters	5 characters
23 X 23	17 characters	11 characters	7 characters
25 X 25	24 characters	16 characters	10 characters
27 X 27	30 characters	20 characters	13 characters
29 X 29	38 characters	25 characters	16 characters
31 X 31	46 characters	30 characters	20 characters
33 X 33	54 characters	36 characters	24 characters
35 X 35	64 characters	42 characters	28 characters
37 X 37	73 characters	49 characters	32 characters
39 X 39	84 characters	56 characters	36 characters
41 X 41	94 characters	63 characters	41 characters
43 X 43	106 characters	70 characters	46 characters
45 X 45	118 characters	78 characters	51 characters
47 X 47	130 characters	87 characters	57 characters
49 X 49	144 characters	96 characters	63 characters

Table 47. ECC-200 Square Characteristics

(Row x Column)	Maximum Numeric	Maximum Alphanumeric	Maximum 8-Byte Data
10 X 10	6 characters	3 characters	1 character
12 X 12	10 characters	6 characters	3 characters
14 X 14	16 characters	10 characters	6 characters
16 X 16	24 characters	16 characters	10 characters
18 X 18	36 characters	25 characters	16 characters
20 X 20	44 characters	31 characters	20 characters
22 X 22	60 characters	43 characters	28 characters
24 X 24	72 characters	52 characters	34 characters
26 X 26	88 characters	64 characters	42 characters
32 X 32	124 characters	91 characters	60 characters
36 X 36	172 characters	127 characters	84 characters
40 X 40	228 characters	169 characters	112 characters
44 X 44	288 characters	214 characters	142 characters
48 X 48	348 characters	259 characters	172 characters
52 X 52	408 characters	304 characters	202 characters
64 X 64	560 characters	418 characters	278 characters
72 X 72	736 characters	550 characters	366 characters
80 X 80	912 characters	682 characters	454 characters
88 X 88	1152 characters	862 characters	574 characters
96 X 96	1392 characters	1042 characters	694 characters
104 X 104	1632 characters	1222 characters	814 characters
120 X 120	2100 characters	1573 characters	1048 characters
132 X 132	2608 characters	1954 characters	1302 characters
144 X 144	3116 characters	2335 characters	1556 characters

Table 48. ECC-200 Rectangular Characteristics

(Row x Column)	Maximum Numeric	Maximum Alphanumeric	Maximum 8-Byte Data
8 X 18	10 characters	6 characters	3 characters
8 X 32	20 characters	13 characters	8 characters
12 X 26	32 characters	22 characters	14 characters
12 X 36	44 characters	31 characters	20 characters
16 X 36	64 characters	46 characters	30 characters
16 X 48	98 characters	72 characters	47 characters

Data Matrix Example

The following commands generated the Data Matrix barcodes shown below. In the command sequence, graphics mode data is *italicized*, and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

*^PY^-^M01,01,010^KF^***BNMXD8C36R12E200I5,0123456789^G**^KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 0.1 inches and character width was selected at 0.1 inches.
A 0.1 justification value plus 0 additional dots was selected for data placement.
^KF activated Dark Print.
^B introduced the barcode command.
N deselected printing the readable data field.
Letter M selected the Data Matrix barcode.
XD8 designates the x-dimension width of a single square module as 8 printer dots.
C36 sets the number of columns in the symbol at 36.
R12 sets the number of rows in the symbol at 12.
E200 sets the error correction level at ECC-200.
I5 set the format ID. This value is ignored with the ECC-200 error correction level set.
, (comma) separates the previous information from the data field.
0123456789 is the barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

*^PY^-^M01,01,010^KF^***BNM,0123456789^G**^KF^-^PN^-*

*^M0101010^KF^***IBARC,DATAMATRIX,XD8,C36,R12,E140,I5,N,A1B2C3D4E5F6G7H8I9J0K12^G**^KF^-*

Identicon

The Identicon barcode structure is shown in Figure 14 and described on following pages.

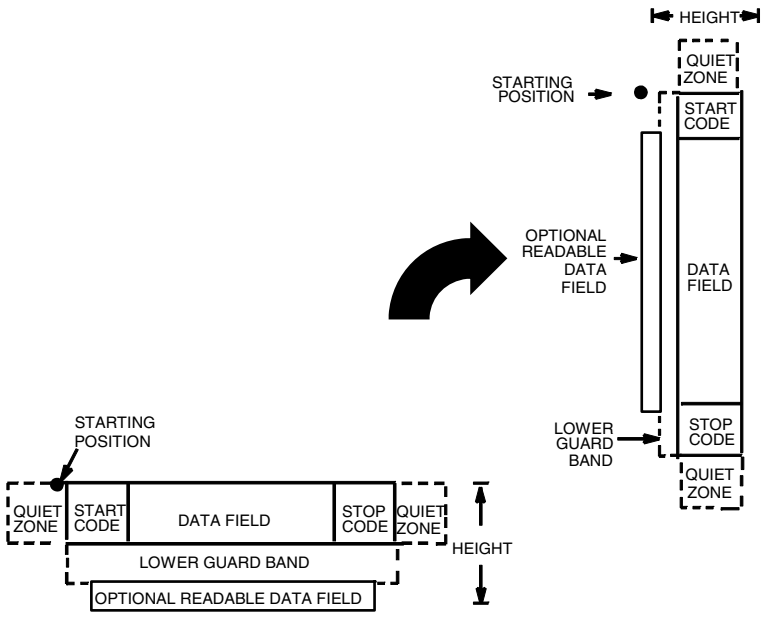


Figure 14. Identicon Structure

Quiet Zone

Quiet zones extend on both ends of the barcode to permit the scan to begin and end in a blank area. The quiet zone should be at least 0.25 inch wide and completely blank.

Start/Stop Codes

The Start/Stop codes identify the leading and trailing end of the barcode. The Start/Stop code is automatically produced with each barcode.

Data Field

The barcode symbol uses a series of wide and narrow bars to represent the 10 numeric characters (0 - 9) and Start/Stop codes. All the information is contained in the width of the bars, the spaces serving only to separate the individual bars. The wide bars are conventionally three times the widths of the narrow bars. The spaces may be any reasonable width but are typically equal to the narrow bars. The barcode can encode up to 40 numbers. Each data character is represented by 5 bars separated by spaces. There must be two wide bars among the 5 bars. See Table 49 for symbol coding.

Readable Data

barcode data is printed below the horizontal barcode and to the left of the vertical barcodes. The lower guard band is provided when the readable data filed is selected.

Table 49. Identicon Symbol Coding

Character	Code
0	00110
1	10001
2	01001
3	11000
4	00101
5	10100
6	01100
7	00011
8	10010
9	01010
Start	110
Stop	101

Identicon Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p* E *data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] E [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 50 to print the readable data field in the corresponding font with the specified guard band gap.

Table 50. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :
: Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

  Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

  Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

E
: The type code for IDENTICON. Enter **E**.

ratio
: Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**. VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. For example, VGL accepts wide/narrow ratio values of 2 and 5, respectively; however a narrow element larger than the wide element produces an unreadable barcode. When designing unique ratio data, carefully plot wide and narrow ratios to conform to readable barcodes.

data
: The barcode data. IDENTICON encodes from 1 through 40 characters. The characters available for the data field are **0** through **9** (hex 30 through 39).

(cc)G
: Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Intelligent Mail 4-State Barcode

Intelligent Mail 4-state is a barcode symbology, introduced by USPS to support the US Mail 4-state customer barcode. It is also known as the USPS OneCode Solution or USPS 4-State Customer Barcode. This barcode is identified by four different types of bars:

- **Full Height** - fixed height
- **Tracker** - a small center section
- **Ascender** - extends from the top of the Full Height limit to the bottom of the Tracker limit.
- **Descender** - extends from the top of the Tracker Limit to the bottom of the Full Height limit.

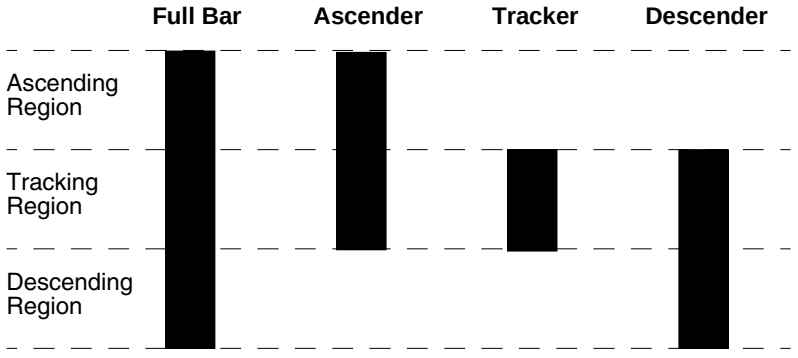


Figure 15. Intelligent Mail Barcode Bar Types

Customer Data must be in numeric format only. PDF is not allowed for Intelligent Mail Barcode.

Additional information regarding use of this barcode can be obtained from the USPS publication *Intelligent Mail Barcode Technical Resource Guide*.

Intelligent Mail Command Format

Default Ratio: (cc) dir N j data (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
Dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes. Enter **C** for vertical barcodes.
N	Turns off the readable data field. Enter **N**.
j	The type code for Intelligent Mail. Enter **j**.

data — The barcode data. The table later in this section shows the valid parameters for the all the fields. The Tracking Code is 20 digits in length. The Routing Code is optional, but if it is included, it must be 5, 9 or 11 digits in length. The minimum total input data is 20 and the maximum total input data is 31 numeric digits. VGL encodes any length of input data within this range into a 4-state customer barcode string consisting of 65 bars. A check digit is automatically added by VGL.

(cc)G — Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Table 51. Data Field Parameters

Type	Field	Digits
Tracking Code	Barcode Identifier	2 Second digit must be 0 - 4.
	Service Type Identifier	3
	Mailer Identifier	6 or 9
	Serial Number	9 when Mailer ID is 6 digits 6 when Mailer ID is 9 digits
Routing Code	Delivery Point Zip Code	0, 5, 9, 11
Total		20 minimum, 31 maximum

Intelligent Mail 4-State Barcode Example

The following command generates the horizontal Intelligent Mail barcode shown below. In the command sequence, graphics mode data is italicized and barcode data is boldface. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,000^KF^*__BNj01234567094987654321012345678^G__^KF^-^PN^-*

Interleaved 2/5

The Interleaved 2/5 barcode structure is shown in Figure 16 and described on following pages.

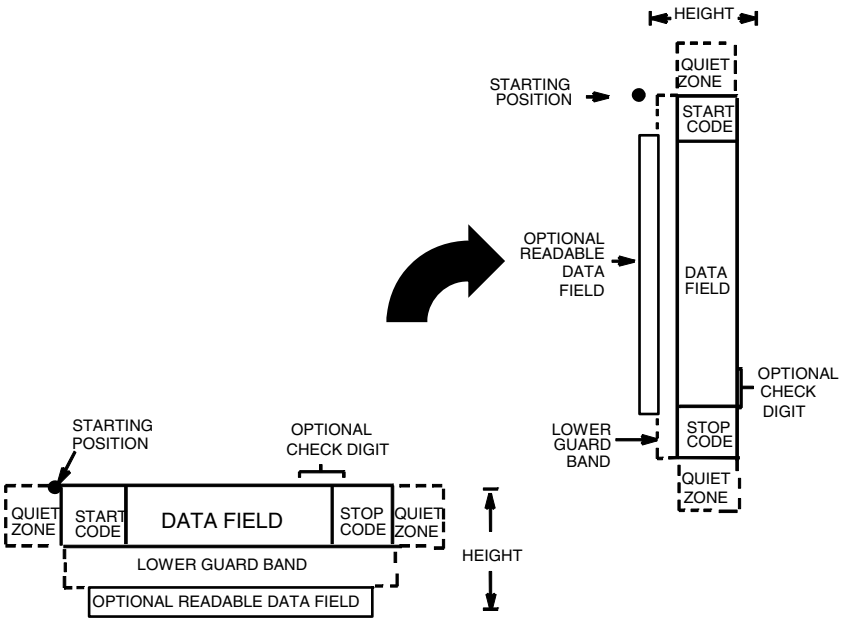


Figure 16. Interleaved 2/5 Structure

Quiet Zone

Both ends of the barcode structure have blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

Unique start and stop codes permit bidirectional scanning. Both start and stop codes contain bars and spaces. They are automatically produced.

Data Field

The barcode symbol uses a series of wide and narrow bars and spaces to represent numeric characters. The structure is 2 wide elements (bars or spaces) and 3 narrow elements. In the barcode, two characters are interleaved (paired); bars are used to represent data characters occupying the odd-numbered positions, and spaces are used to represent data characters occupying the even-numbered positions. The interleaving process requires an even number of characters; if an odd number of characters are encoded, a leading zero is automatically inserted to change the number of characters to an even number.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. barcode data is printed below the horizontal barcode symbol and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected.

Check Digit

An optional check digit is inserted for type k and l barcodes. The optional check digit is automatically calculated and inserted in the barcode symbol. The check digit provides the means to verify accurate scanning.

Interleaved 2/5 Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p type data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 52 to print the readable data field in the corresponding font with the specified guard band gap.

Table 52. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or : Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type Represents the barcode type. Select one of the I-2/5 barcode type codes shown in Table 53.

Table 53. Interleaved 2/5 Barcodes

Standard Type Code	IBARC, Type Code	# of Data Characters	Check Digits	Default Bar/ Space Ratios*
K	INT2/5	1-40	None	1:1:3:3
k	INT2/5CD	1-40	Mod 10	1:1:3:3
L	INT2/5A	1-40	None	1:2:4:5
l	INT2/5CDA	1-40	Mod 10	1:2:4:5
*Ratios represent dot width of the bar/space elements as follows: *Narrow Bar : Narrow Space : Wide Bar : Wide Space*.				

ratio Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**. VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

Interleaved 2/5 barcodes use four-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *narrow bar* : *narrow space* : *wide bar* : *wide space*. For example, enter 2266 in the ratio parameter for:

2 dot-wide narrow bar
2 dot-wide narrow space
6 dot-wide wide bar
6 dot-wide wide space

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. For example, VGL accepts wide/narrow ratio values of 2 and 5, respectively; however a narrow element larger than the wide element produces an unreadable barcode. When designing unique ratio data, carefully plot wide and narrow ratios to conform to readable barcodes.

data	The barcode data. Interleaved 2/5 encodes from 1 through 40 characters. The characters available for the data field are **0** through **9** (hex 30 through 39). If an odd number of characters are encoded, a leading zero is automatically inserted in the data field to change the number of characters to an even number.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Interleaved 2/5 Examples

The following command generates the horizontal default ratio Interleaved 2/5 barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,000^KF^**BYK2244595**^**G**^*KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for data placement.
^KF activated Dark Print. ^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter K selected Interleaved 2/5 with the default 1:1:3:3 ratio.
2244595 is the barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the Interleaved 2/5 barcode below using OCR-B font, double the default ratio, and data of 2244595:

*^PY^-^M10,10,000^KF^***BB9L248A2244595^G^***KF^-^PN^-*

The following command generates the vertical Interleaved 2/5 barcode below using standard 10 cpi font with the standard default ratio and data of 2244595:

*^PY^-^M10,10,000^KF^***CYK2244595^G^***KF^PN^-*

The following command generates the same vertical Interleaved 2/5 barcode above, except that double the default ratio is used:

*^PY^-^M10,10,000^KF^***CY9K22662244595^G^***KF^-^PN^-*

Maxicode

The Maxicode barcode is a fixed size matrix symbology made up of an offset of rows of hexagonal elements arranged around a unique finder pattern. Maxicode is suitable for high speed scanning applications, and is capable of encoding all of the 256 ASCII characters.

Readable Data

The Maxicode barcode does not support a human readable form.

Data Field

The data field of a Maxicode barcode is divided into a primary message and a secondary message. The primary message has a fixed structure, while the secondary message has a free format. The maximum number of characters encoded in the message depends on the error correction mechanism used. When the Standard Error Correction (SEC) method is in use (see the *mode* definition, below) a maximum of 84 symbol characters can be encoded. Each segment in the secondary message is 21 characters long.

Maxicode Command Format

Default Ratio: (cc) *dir* N % [Z] *mode data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes, **C** for vertical barcodes.
N	Enter **N** to turn off the readable data field.
%	Represents the Maxicode barcode type. Enter **%**.
Z	Optional parameter to print the zipper. Enter **Z** to exercise this option.
mode	Represents the desired Maxicode mode. The legal modes are **2**, **3**, **4**, and **6**. If mode 0 is entered, it is converted to mode 2 or 3 depending on the postal code. If mode 1 is entered, it is converted to mode 4. All other modes cause an error to be reported. Table 54 defines the modes supported.

Table 54. Maxicode Barcode Mode

Mode	Definition
2	Primary and secondary messages employ SEC. Primary message is a structured carrier message with a numeric postal code.
3	Primary and secondary messages employ SEC. Primary message is a structured carrier message with an alphanumeric postal code.
4	Primary and secondary messages together encode up to 93 characters.
6	Primary and secondary messages together encode up to 93 characters. For reader configuration purposes only.

data Represents the data to be barcoded. There are two different ways the Maxicode data field can be formatted: Standard Data Field and UPS Shipping Data Field.

Standard Data Field

Modes 2 and 3 have their primary message structured as shown in Table 55. The data following the primary message is the secondary message and has a free format.

Table 55. Standard Data Fields

Character Positions	Title	Data
0 - 2	Class of Service	Numeric
3 - 5	Country Code	Numeric
6 - 14	Postal Code	9 Digit Numeric for US **or** 6 Digit Alphanumeric for Canada
15, 16	Separator	'>A'
17 - ...	Secondary Message	Free Format

UPS Shipping Data Field

This syntax begins with seven encoded data characters followed by a date (*yy*). The first four characters are the Message Header and the next five are the Transportation Data Format Header. The format of the Message Header is “[)>Rs”. The Transportation Data Format Header is “01Gs*yy*” where *yy* is the year, and “G's” and “R's” are control characters. The structure is shown in Table 56.

Table 56. UPS Shipping Data Fields

Character Positions	Title	Data
0 - 3	Message Header	[)>Rs
4 - 8	Transportation Data Format Header	01Gs*yy*
9 - 17	Postal Code	9 Digit Numeric for US **or** 6 Digit Alphanumeric for Canada
18	Separator	Gs
19 - 21	Country Code	Numeric
22	Separator	Gs
23 - 25	Class of Service	Numeric
26	Separator	Gs
27 - ...	Secondary Message	As per the UPS Guide To Barcoding

(cc)G Terminates the barcode command. Enter the SFCC for your VGL configuration followed by any valid command character or **G**, the universal sequence terminator.

Maxicode Control Characters

The non-printable control characters can be generated by using the switch characters defined in Table 57.

NOTE: If a “>” has to be part of the data stream, enter the character twice.

NOTE: <pp> = Shift Out Character

Table 57. Maxicode Control Characters

Control Characters	Alternate Characters
NUL	<pp>SP
SOH	<pp>!
STX	<pp>"
ETX	<pp>#
EOT	<pp>$
ENQ	<pp>%
ACK	<pp>&
BEL	<pp>'
BS	<pp>(
HT	<pp>)
LF	<pp>*
VT	<pp>+
FF	<pp>,
CR	<pp>-
SO	<pp>.
SI	<pp>/
DLE	<pp>`
DC1	<pp>a
DC2	<pp>b
DC3	<pp>c
DC4	<pp>d
NAK	<pp>e
SYN	<pp>f
ETB	<pp>g
CAN	<pp>h
EM	<pp>i
SUM	<pp>j
ESC	<pp>k
FS	<pp>l
GS	<pp>m
RS	<pp>n
US	<pp>o

Maxicode Examples

The following command generates the Maxicode barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

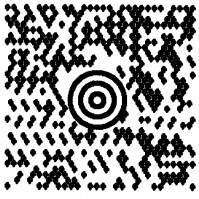
^PY^-^M10,10,050^**BN%2999840068107317>AThis is a secondary message.^G**^-*^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.5 justification value plus 0 additional dots was selected for the data placement.
^B introduced the barcode command.
N selects no readable data field.
% selected Maxicode barcode.
2 selects Maxicode mode 2.
999840068107317 is the primary barcode data.
>A separates the primary barcode data from the secondary barcode data ("This is a secondary message").
^G^- terminated the barcode command sequence.
^PN^- terminated the graphics mode.

The following example generates the MAXICODE barcode shown below:

NOTE: "|" in the barcode represents the Shift Out Character.

^PY^-^M10,10,050^**IBARC,MAXICODE,N,2[)>|n01|m96841706672|m840|m001|m1Z12345675|mUPSN|m12345E|m089|m|m1/1|m10.1|mY|m|m|mUT|n|$^G**^-*^PN^-*



MSI

The MSI structure is shown in Figure 23 and described on the following pages.

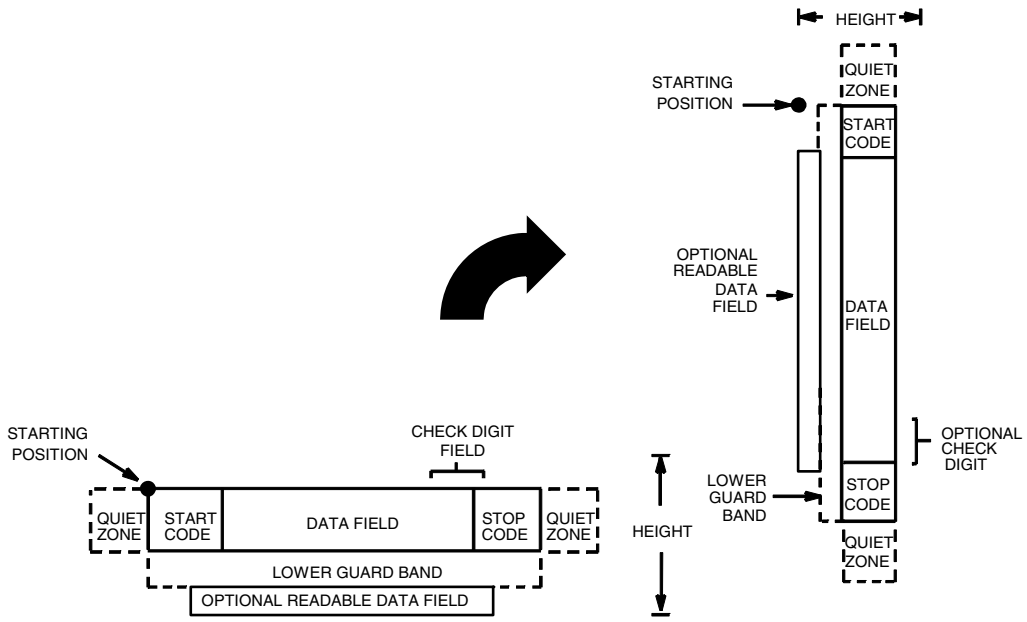


Figure 17. MSI Barcode Structure

Quiet Zone

Both ends of the barcode structure require blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

The start/stop code is a unique character identifying the leading and trailing end of the barcode. The start/stop code is automatically produced with each barcode, and permits bidirectional barcode scanning.

Data Field

The MSI barcode symbol uses a series of wide and narrow bars and spaces to represent numeric characters. The structure is 1-module-wide narrow elements and 2-module-wide wide elements; elements can be a bar or a space. Each character is composed of 4 data bits, with each bit made up of a bar and a space totalling 3 modules.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. barcode data is printed below the horizontal barcode symbol, and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected.

Check Digit

The check digit provides the means of verifying accurate scanning. For MSI Types G, H, I, and X, a specific check digit, Modulo-10 or Modulo-11 (or both), is automatically calculated and appended in the barcode symbol. MSI Type F does not use a check digit.

MSI Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p type data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed below to print the readable data field in the corresponding font with the specified guard band gap.

Table 58. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or : Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type Represents the barcode type. As shown in Table 59, MSI Types F, G, H, I, and X are available. Enter the type code corresponding to the MSI barcode type desired.

Table 59. MSI Barcodes

Standard Type Code	IBARC, Type Code	# of Data Characters	Check Digits	Default Bar/ Space Ratios*
F	MSI	1-13	None	1:1:2:2
G	MSI10	1-13	Mod 10	1:1:2:2
H	MSI1010	1-13	Mod 10, Mod 10	1:1:2:2
I	MSI1110	1-13	Mod 11, Mod 10	1:1:2:2
X	MSI11	1-13	Mod 11	1:1:2:2
*Ratios represent dot width of the bar/space elements as follows: *Narrow Bar : Narrow Space : Wide Bar : Wide Space*.				

ratio Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**. VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

MSI barcodes use four-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *narrow bar* : *narrow space* : *wide bar* : *wide space*. For example, enter 2244 in the ratio parameter for:

2 dot-wide narrow bar
2 dot-wide narrow space
4 dot-wide wide bar
4 dot-wide wide space

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. For example, VGL accepts wide/narrow ratio values of 2 and 5, respectively; however, a narrow element larger than the wide element produces an unreadable barcode. When designing unique ratio data, carefully plot wide and narrow ratios to conform to readable barcodes.

data	The barcode data. MSI encodes from 1 through 13 characters. The available characters for the data field are **0** through **9** (hex 30 through 39).
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

MSI Barcode Examples

The following command generates the horizontal default ratio MSI barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,000^KF^**BYH87654321^G**^*KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for the data placement.
^KF activated Dark Print.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter H selected MSI barcode Type H, which automatically appends two Mod 10 check digits to the barcode data.
87654321 is the barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the horizontal MSI barcode below using OCR-B font and double the default ratio:

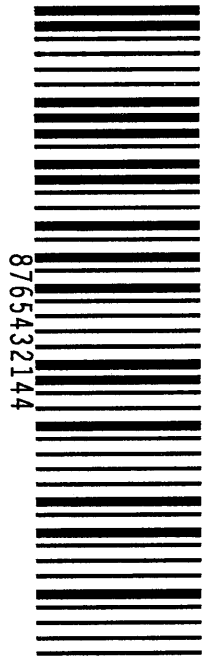
*^PY^-^M10,10,000^KF^***BB9X224487654321^G***^KF^-^PN^-*

The following command generates the vertical MSI barcode below using standard 10 cpi font, the standard default ratio, and data of 87654321:

*^PY^-^M10,10,000^KF^***CYF87654321^G***^KF^-^PN^-*

The following command generates the same vertical MSI barcode above, except that double the default ratio is used:

^PY^-^M10,10,000^KF^CY9I224487654321^G*^KF^-^PN^-*



PDF417

The PDF417 structure is shown in Figure 18 and described on the following pages.

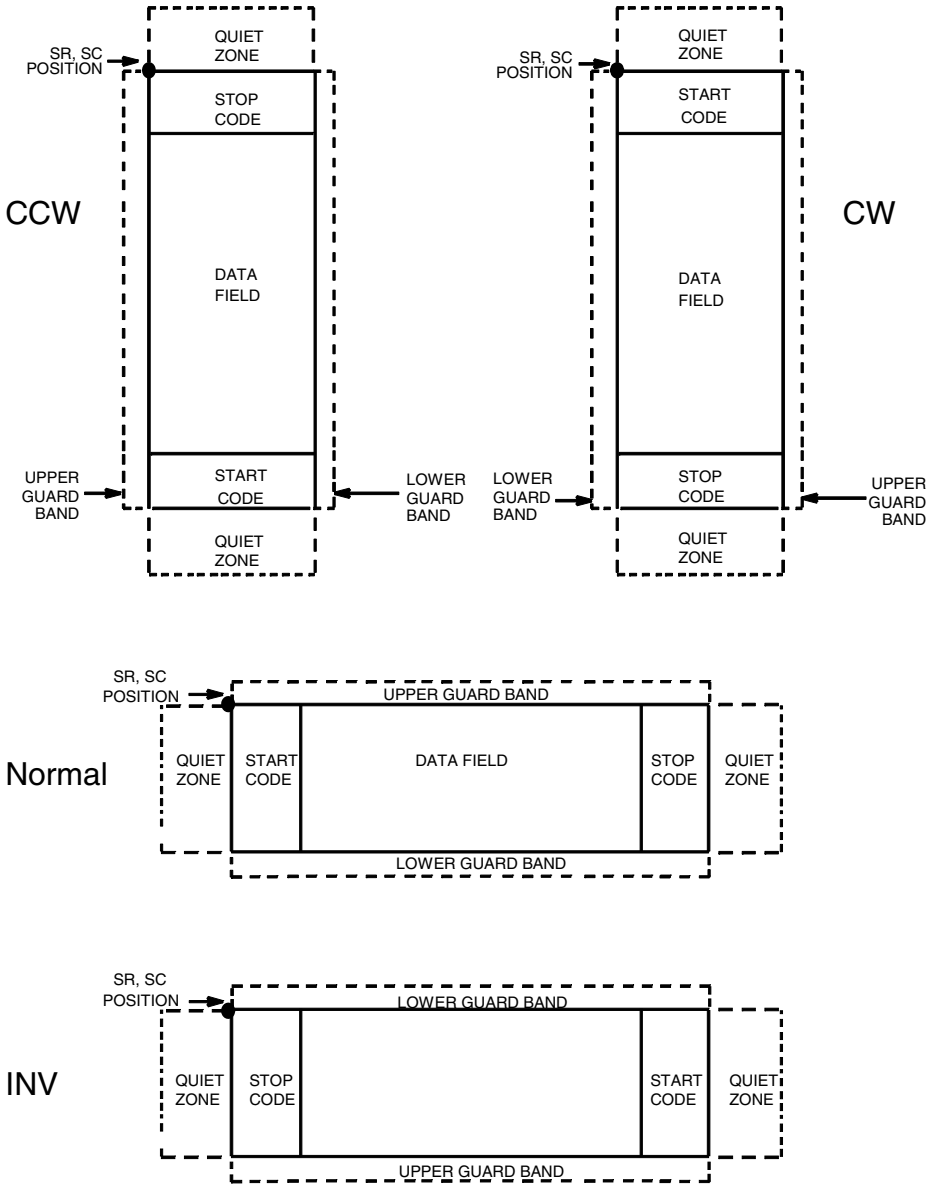


Figure 18. PDF417 Structure

Quiet Zone

Both ends of the barcode structure require blank quiet zones. The quiet zones must be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. Be sure to provide sufficient space on the form for the quiet zones.

Start/Stop Codes

The start/stop codes identify the leading and trailing end of the barcode.

Data Field

PDF417 provides twelve modes to encode data. The first three are pre-established (the remaining nine are user modes, which can be defined by users or industry associations according to specific applications):

1. Extended Alphanumeric Compaction mode (EXC). Comprised of four sub-modes, this mode offers encodation of all printable ASCII characters. This is the default mode; the IGP uses shift or latch characters to enable other modes.
2. Binary/ASCII Plus mode. This offers encodation for all ASCII characters, printable or not, and binary values.
3. Numeric Compaction mode. This offers encodation for numeric values to a density of almost 3 digits per code word.
4. The IGP will automatically switch between modes to provide the smallest encodation for the data.

Security Level

PDF417 can detect and correct errors. Each label has 2 code words of error detection. You can select the error correction capacity based on application needs. Specify a security level in the range of 0 - 8, at the time of printing. PDF417 can also recover from omissions and misdecodes of code words. Since it requires two code words to recover from a misdecode, one to detect the error and one to correct for it, a given security level can support half the number of misdecodes that it can of undecoded words.

PDF

Print Data Field is not offered due to the large amount of data that can be encoded.

PDF417 Command Format

Default Ratio: (cc) *dir p type* [X[D]*n*] [Y[D]*n*] [(H*n*)] (W*n*)] [A*h:w*] [R*n*] [C*n*] [S*n*], DATA^G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal or **C** for vertical barcodes.
p	An optional readable data field. Enter **N** so no readable data prints in this field.
type	Enter **&** for PDF417.
X[D]*n*	Optional parameter to designate the width of the narrow element in either the default 60 X 72 dots per inch or, if the **D** is given, in target dots. The default size is 1/60th of an inch.
Y[D]*n*	Optional parameter to designate the height of the barcode in either the default 60 X 72 dots per inch or, if the **D** is given, in target dots. The default size is 2/72nd of an inch.
H*n*	Optional parameter to adjust the overall height of the barcode symbol (including human readable data). Height adjustments are made in 0.1-inch increments; enter **H** and a value from **4** through **99** to select height adjustments from 0.4 through 9.9 inches. Parameters W*n*, R*n*, C*n* or A cannot be entered if this parameter is used.
W*n*	Optional parameter to adjust the maximum width of the symbol based on the narrow element width. Enter **W***n*; where *n* is the overall width in tenths of an inch. Parameters H*n*, R*n*, C*n* or A cannot be entered if this parameter is used.
A*h:w*	Optional parameter for specifying the symbol height-to-width ratio where *h* is the height and *w* is the width, both expressed as integers. The default is 1:2. Parameters H*n*, W*n*, R*n*, or C*n* cannot be entered if this parameter is used.
R*n*	Optional parameter that specifies the number of rows the symbol will have. Enter **R** followed by the number of rows in the range of **3** through **90** in multiples of 3. Parameters H*n*, W*n*, C*n* or A cannot be entered if this parameter is used.
C*n*	Optional parameter that specifies the number of columns the symbol will have. Enter **C** followed by the number of columns in the range of **1** through **90**. Parameters H*n*, W*n*, R*n* or A cannot be entered if this parameter is used.

S*n*	Optional parameter that specifies the security level. Enter **S** followed by the security level in the range of **0** through **8**. The default is 2.
data	Enter the data for the barcode. A null data field (no characters) is not permitted. The data field can contain any character including carriage returns and line feeds. The length of the data field is variable; however, the maximum length is usually limited to 1024 bytes to minimize potential reading errors.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

PDF417 Example

Figure 19 illustrates a horizontal PDF417 barcode generated by the following program:

```
^PY^-
^M10,10,000^KF^BN&X1Y2,ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmn
opqrstuvwxyz‘1234567890-
=\[];’,./!@#$%^&()_+|{}:”<>?^G^KF^-^PN^-
```

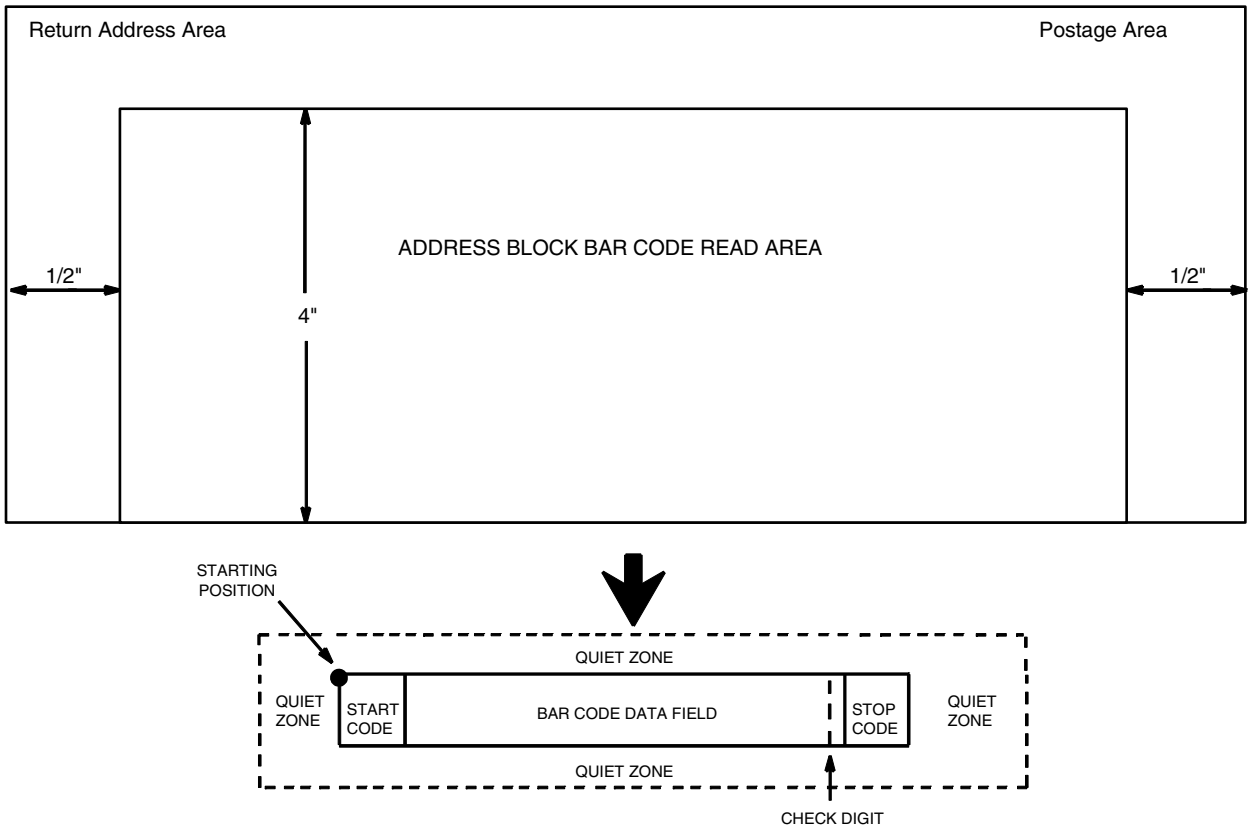
Figure 19. Sample PDF417 Barcode

Planet

The Planet barcode was introduced by the U.S. Postal Service under the product name “Confirm.” Planet is a 12-digit barcode used to track mail electronically, both inbound and outbound. Under the “Confirm” process, the first two digits of the Planet data field defines the service expected. The next nine digits are customer information, and the last digit is the check digit.

The Planet barcode structure is illustrated in Figure 20 and Figure 21 and described on the following pages. The Planet code can be a part of the address block and appear anywhere within a vertical 4-inch area across the width of the mail piece.

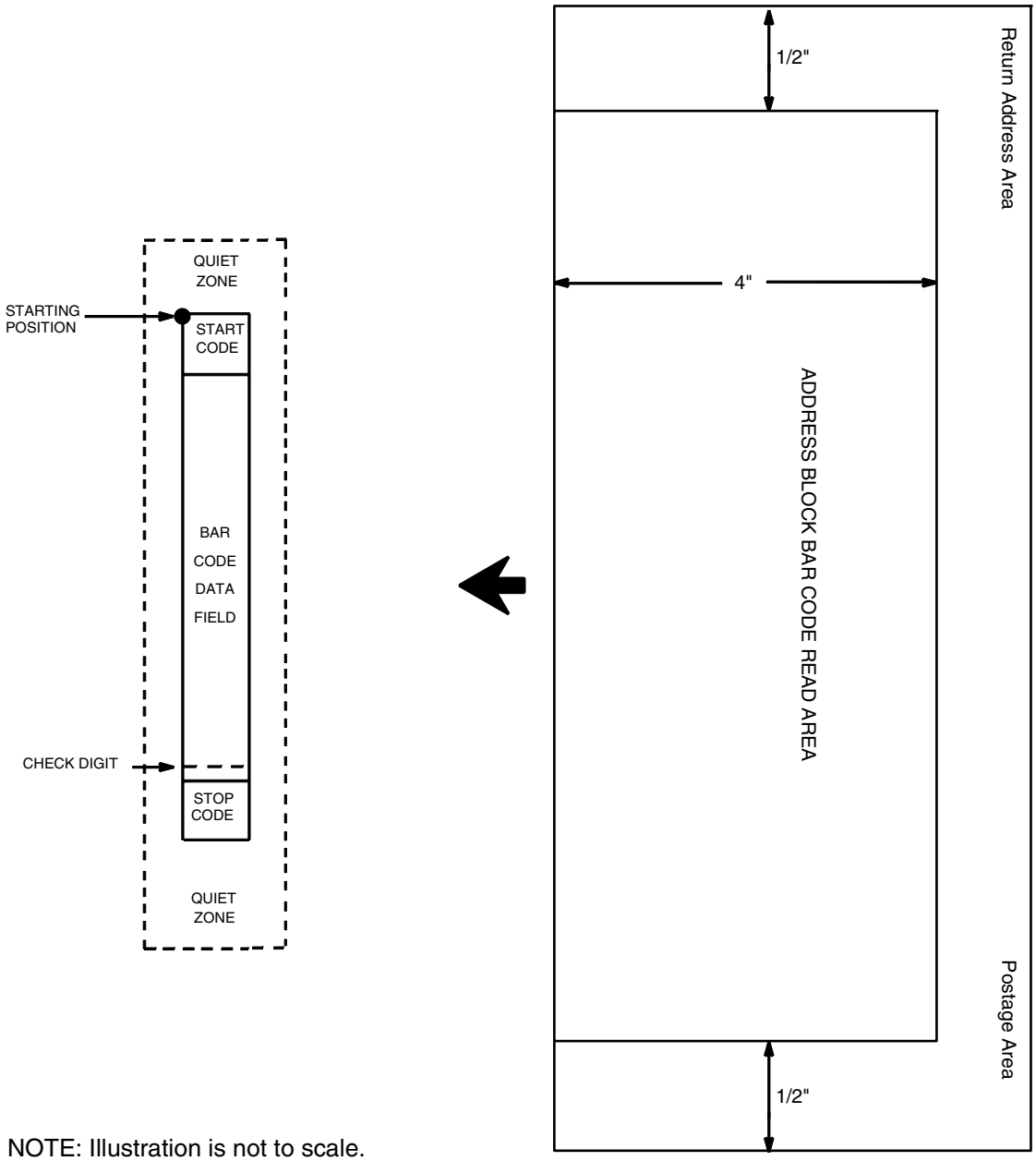
The Planet barcode cannot use variable ratios and does not have a readable data field.



NOTE: Illustration is not to scale

Figure 20. Planet Structure

NOTE: Additional information regarding Planet barcode requirements can be obtained from the U.S. Postal Service's Publication 25: *A Guide to Business Mail Preparation.*



NOTE: Illustration is not to scale.

Figure 21. Planet Structure (Vertical Bar)

Quiet Zone

The barcode structure requires a completely blank quiet zone which extends 4.75 inches from the right edge of the mail piece. In addition, a minimum quiet zone of 0.040-inch above and below the barcode data must also be provided. You must provide sufficient space for this zone.

Start/Stop Code

The start and stop codes are referred to as “framing bars” in Planet. The start and stop codes are each one tall bar, one identifying the leading and trailing end of the barcode. The start/stop code is automatically produced with each barcode. The start/stop code structure permits barcode scanning in a left-to right direction only.

Data Field

The barcode data produces a single field of 60 bars for an 11-digit data field. The bars are grouped in sets of five. Each set of five bars (comprised of three tall bars and two short bars) represents one of the five digits of the zip code, plus the four-digit zip code extension. If the Delivery Point Barcode is used, an additional two-digit code is also added to make an 11-digit data field.

Exact barcode dimensions depend on the type of printer used, but fall within the following specifications:

Each bar width is equal and is .020-inch ± .005-inch. Each bar height is either a tall (full) or short (half) bar, representing a 1 or 0, respectively. Each tall bar is .125-inch ± .010-inch; each short bar is .050-inch ± .010-inch. Horizontal spacing between bars (pitch) is 22 bars ± 2 bars per inch over any 0.50-inch portion of the barcode. Horizontal spacing at 24 and 20 bars per inch is 0.0416-inch and .050-inch, respectively, with a clear vertical space ranging from 0.012-inch to 0.040-inch between bars.

Check Digit

The twelfth digit represents the automatic check digit character. The Mod 10 check digit is added automatically to verify accurate scanning.

Planet Command Format

Default Ratio: (cc) *dir* N r *data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.
N	Turns off the readable data field. Enter **N**.
r	The type code for Planet. Enter **r**.
data	The barcode data. Planet barcodes encode exactly 11 numeric digits. A check digit is automatically added by VGL.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

NOTE: The Planet barcode symbol height is fixed at 0.125 inches.

Planet Examples

The following command generates the horizontal Planet barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

*^PY^-^M^KF^***BNr01234567890^G***^KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
^KF activated Dark Print.
^B introduced the barcode command.
N selected no readable data field.
r selected Planet barcode.
01234567890 is the barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

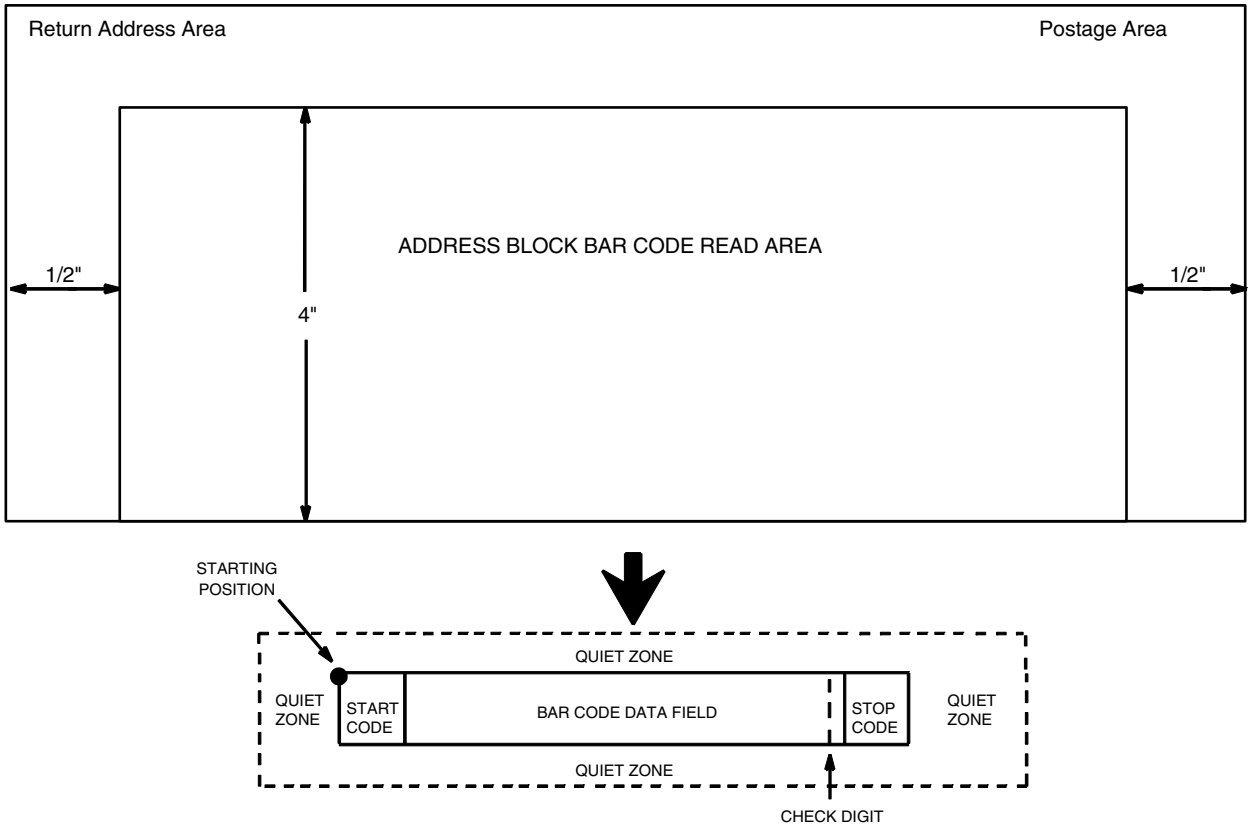
The following command generated the vertical Planet barcode below with data of 01234567890:

*^PY^-^M^KF^***CNr01234567890^G***^KF^-^PN^-*

POSTNET

The POSTNET barcode structure is illustrated in Figure 22 and Figure 23 and described on the following pages. The POSTNET code can be a part of the address block and appear anywhere within a vertical 4-inch area across the width of the mail piece.

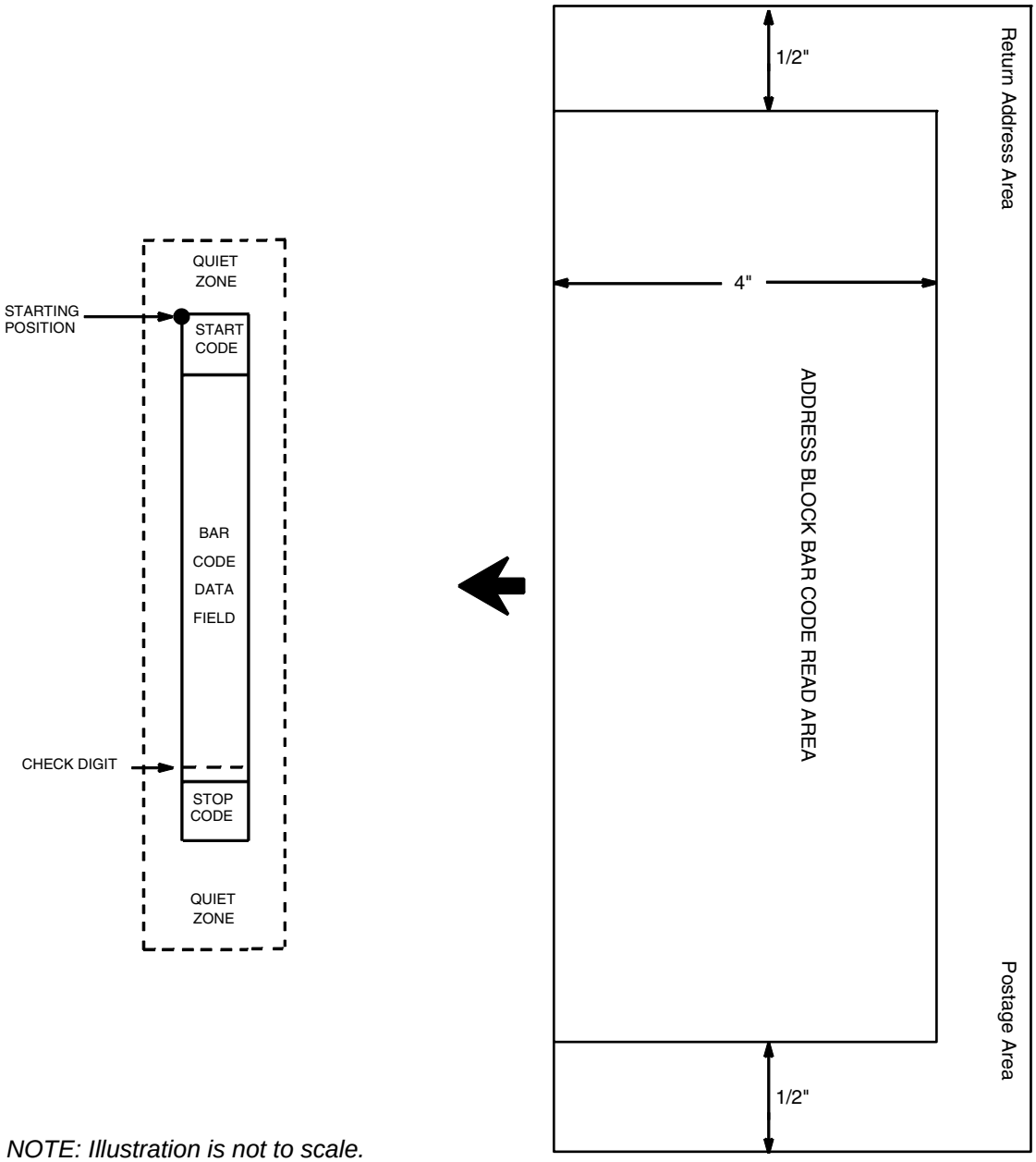
The POSTNET barcode cannot use variable ratios and does not have a readable data field.



NOTE: Illustration is not to scale

Figure 22. POSTNET Structure

NOTE: Additional information regarding POSTNET barcode requirements can be obtained from the U.S. Postal Service's Publication 25: *A Guide to Business Mail Preparation.*



NOTE: Illustration is not to scale.

Figure 23. POSTNET Structure (Vertical Bar)

Quiet Zone

The barcode structure requires a completely blank quiet zone which extends 4.75 inches from the right edge of the mail piece. In addition, a minimum quiet zone of 0.040-inch above and below the barcode data must also be provided. You must provide sufficient space for this zone.

Start/Stop Code

The start and stop codes are referred to as “framing bars” in POSTNET. The start and stop codes are each one tall bar, one identifying the leading and trailing end of the barcode. The start/stop code is automatically produced with each barcode. The start/stop code structure permits barcode scanning in a left-to right direction only.

Data Field

The barcode data produces a single field of 30 bars for a 5-digit field, 50 bars for a 9-digit data field, or 60 bars for an 11-digit data field. The bars are grouped in sets of five. Each set of five bars (comprised of two tall bars and three short bars) represents one of the five digits of the zip code, plus the four-digit zip code extension. If the Delivery Point Barcode is used, an additional two-digit code is also added to make an 11-digit data field.

Exact barcode dimensions depend on the type of printer used, but fall within the following specifications:

Each bar width is equal and is .020-inch ± .005-inch. Each bar height is either a tall (full) or short (half) bar, representing a 1 or 0, respectively. Each tall bar is .125-inch ± .010-inch; each short bar is .050-inch ± .010-inch. Horizontal spacing between bars (pitch) is 22 bars ± 2 bars per inch over any 0.50-inch portion of the barcode. Horizontal spacing at 24 and 20 bars per inch is 0.0416-inch and .050-inch, respectively, with a clear vertical space ranging from 0.012-inch to 0.040-inch between bars.

Check Digit

The sixth, tenth, or twelfth digit represents the automatic check digit character for the 5, 9, or 11-digit data field, respectively. The Mod 10 check digit is added automatically to verify accurate scanning.

POSTNET Command Format

Default Ratio: (cc) *dir* N * *data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.
N	Turns off the readable data field. Enter **N**.
*	The type code for POSTNET. Enter *****.
data	The barcode data. POSTNET barcodes encode exactly 5, 9, or 11 numeric digits. A check digit is automatically added by VGL.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

NOTE: The POSTNET barcode symbol height is fixed at 0.125 inches.

POSTNET Example

The following command generates the horizontal POSTNET barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

*^PY^-^M^KF^***BN*927047563^G***^KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
^KF activated Dark Print.
^B introduced the barcode command.
N selected no readable data field.
Asterisk (*) selected POSTNET barcode.
927047563 is the barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

Royal Mail

The Royal Mail barcode, like POSTNET, is used for mailing applications. However, the barcode can encode full addresses on labels. Royal Mail barcodes are similar to POSTNET in terms of bar space and width, but have four different types of bars (Full Height, Ascender, Descender, and Tracker), whereas POSTNET only has two bar types (Tall and Short).

The Royal Mail symbology converts alphanumeric characters into patterns of four bars, using combinations of Full Height, Ascender, Descender, and Trackers. It also adds start and stop barcodes as well as a check digit.

Quiet Zone

The barcode structure requires a completely blank quiet zone which is a 2mm border on each side of the barcode.

Start/Stop Code

The start and stop bars identify the orientation of the barcode. The start bar consists of an ascender bar, and is positioned at the leftmost end of the barcode. The stop bar consists of a full height bar, and is positioned at the rightmost end of the barcode adjacent to the check digit.

Data Field

Royal Mail barcodes use four types of bars to encode its data: Full Height, Ascender, Descender, and Tracker. Each Full Height bar is 0.198 inch ± 0.030 inch. The Ascender and Descender bars are about 62.5% of the Full Height bar in length, while the Tracker bar is about 25% of the Full Height bar.

Each bar *width* is equal, and must be .020-inch ± .005-inch. Horizontal spacing between bars (pitch) must be 22 bars ± 2 bars per inch over any 0.50-inch portion of the barcode.

Royal Mail barcodes have a variable length of data field, which consists of valid characters “0” through “9” and “A” through “Z”. Each character is encoded with four bars of varied types.

Check Digit

A modulo-6 check digit is added automatically to the end of the barcode to verify accurate scanning.

Royal Mail Command Format

Default Ratio: (cc) *dir* N Y *data* (cc)G

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
dir	Represents the direction of the barcode. Enter **B** for horizontal barcodes. Enter **C** for vertical barcodes.
N	Turns off the readable data field. Enter **N**.
Y	The type code for Royal Mail. Enter **Y**.
data	The barcode data. A check digit is automatically added by VGL.
(cc)G	Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Royal Mail Example

The following command generates the horizontal Royal Mail barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,000^KF^**BNY050LU178XE2B**^**G**^*KF^-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for the data placement.
^KF activated Dark Print.
^B introduced the barcode command.
N selected no readable data field.
Y selected Royal Mail barcode.
050LU178XE2B is the barcode data.
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

Telepen

The Telepen structure is shown in Figure 24 and described on the following pages.

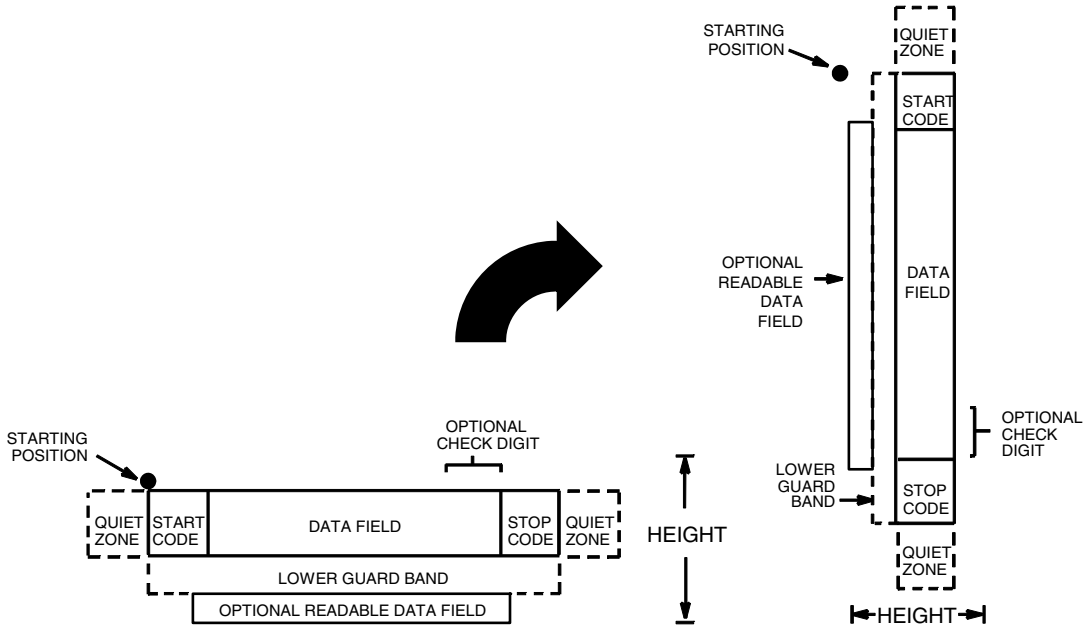


Figure 24. Telepen Structure

Quiet Zone

Both ends of the barcode structure require blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

The start/stop code is a unique character identifying the leading and trailing end of the barcode. The start/stop code is automatically produced with each barcode. The start/stop code structure permits bidirectional barcode scanning.

Data Field

The barcode symbol uses a series of wide and narrow bars and spaces to represent standard alphanumeric characters. Each character is represented by a different series of bars and spaces, both wide and narrow, but is always 16 units in width (for a wide to narrow ratio of 3). Each character starts with a bar and ends with a space.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. barcode data is printed below the horizontal barcode symbol and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected.

Check Digit

A mandatory modulo-127 check digit is inserted into the barcode. This feature provides a means of verifying accurate scanning.

Telepen Command Format

NOTE: Refer to page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p* J *data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] J [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes in Table 27 to print the readable data field in the corresponding font with the specified guard band gap.

Table 60. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :
: Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

  Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

  Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

J
: The type code for Telepen. Enter **J**.

ratio
: Optional parameter (used in conjunction with parameter **9** or **:**) representing the ratios for variable ratio barcodes. The default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**. VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

  Telepen barcodes use four-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width according to the following pattern: *narrow bar : narrow space : wide bar : wide space*. For example, enter 2266 in the ratio parameter for:

  2 dot-wide narrow bar
  2 dot-wide narrow space
  6 dot-wide wide bar
  6 dot-wide wide space.

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. For example, VGL accepts wide/narrow ratio values of 2 and 5, respectively; however a narrow element larger than the wide element produces an unreadable barcode. When designing unique ratio data, carefully plot wide and narrow ratios to conform to readable barcodes.

data
: The barcode data. Telepen encodes 1 through 40 characters from the Telepen full ASCII Character Set shown in Table 29.

(cc)G
: Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Table 61. Telepen Character Set

ASCII	Telepen	ASCII	Telepen	ASCII	Telepen	ASCII	Telepen
NUL	%U	SP	Space	@	%V	`	%W
SOH	$A	!	/A	A	A	a	+A
STX	$B	"	/B	B	B	b	+B
ETX	$C	#	/C	C	C	c	+C
EOT	$D	$	/D	D	D	d	+D
ENQ	$E	%	/E	E	E	e	+E
ACK	$F	&	/F	F	F	f	+F
BEL	$G	'	/G	G	G	g	+G
BS	$H	(	/H	H	H	h	+H
HT	$I	)	/I	I	I	i	+I
LF	$J	*	/J	J	J	j	+J
VT	$K	+	/K	K	K	k	+K
FF	$L	,	/L	L	L	l	+L
CR	$M	—	—	M	M	m	+M
SO	$N	.	.	N	N	n	+N
SI	$O	/	/O	O	O	o	+O
DLE	$P	0	0	P	P	p	+P
DC1	$Q	1	1	Q	Q	q	+Q
DC2	$R	2	2	R	R	r	+R
DC3	$S	3	3	S	S	s	+S
DC4	$T	4	4	T	T	t	+T
NAK	$U	5	5	U	U	u	+U
SYN	$V	6	6	V	V	v	+V
ETB	$W	7	7	W	W	w	+W
CAN	$X	8	8	X	X	x	+X
EM	$Y	9	9	Y	Y	y	+Y
SUB	$Z	:	/Z	Z	Z	z	+Z
ESC	%A	;	%F	[	%K	{	%P
FS	%B	<	%G	\	%L	|	%Q
GS	%C	=	%H	]	%M	}	%R
RS	%D	>	%I	^	%N	^	%S
US	%E	?	%J	_	%O	DEL	%T %X %Y %Z

NOTE: Character pairs /M, /N, and /P through /Y are reserved for future control character pairs.

Telepen Examples

The following command generates the horizontal default ratio Telepen barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^PY^-^M10,10,010^BOJ1234567^G^*-^PN^-*

^PY^- enabled the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.1 justification value plus 0 additional dots was selected for the data placement.
^B introduced the barcode command.
O selected the 3-dot OCR-A font to print the optional readable data field.
J selected the Telepen barcode
1234567 is the barcode data, and ^G terminated the barcode command sequence.
^PN^- terminated the graphics mode.

The following command generated the horizontal Telepen barcode below using Standard 10 cpi font, and data of ABCDEFG:

^PY^-^M10,10,010^BYJABCDEFG^G^*-^PN^-*

UPC-A

The UPC-A barcode can be printed with or without a 2- or 5-digit add-on data field, which is placed at the end of the barcode. The UPC-A barcode structure is shown in Figure 25 and described on the following pages.

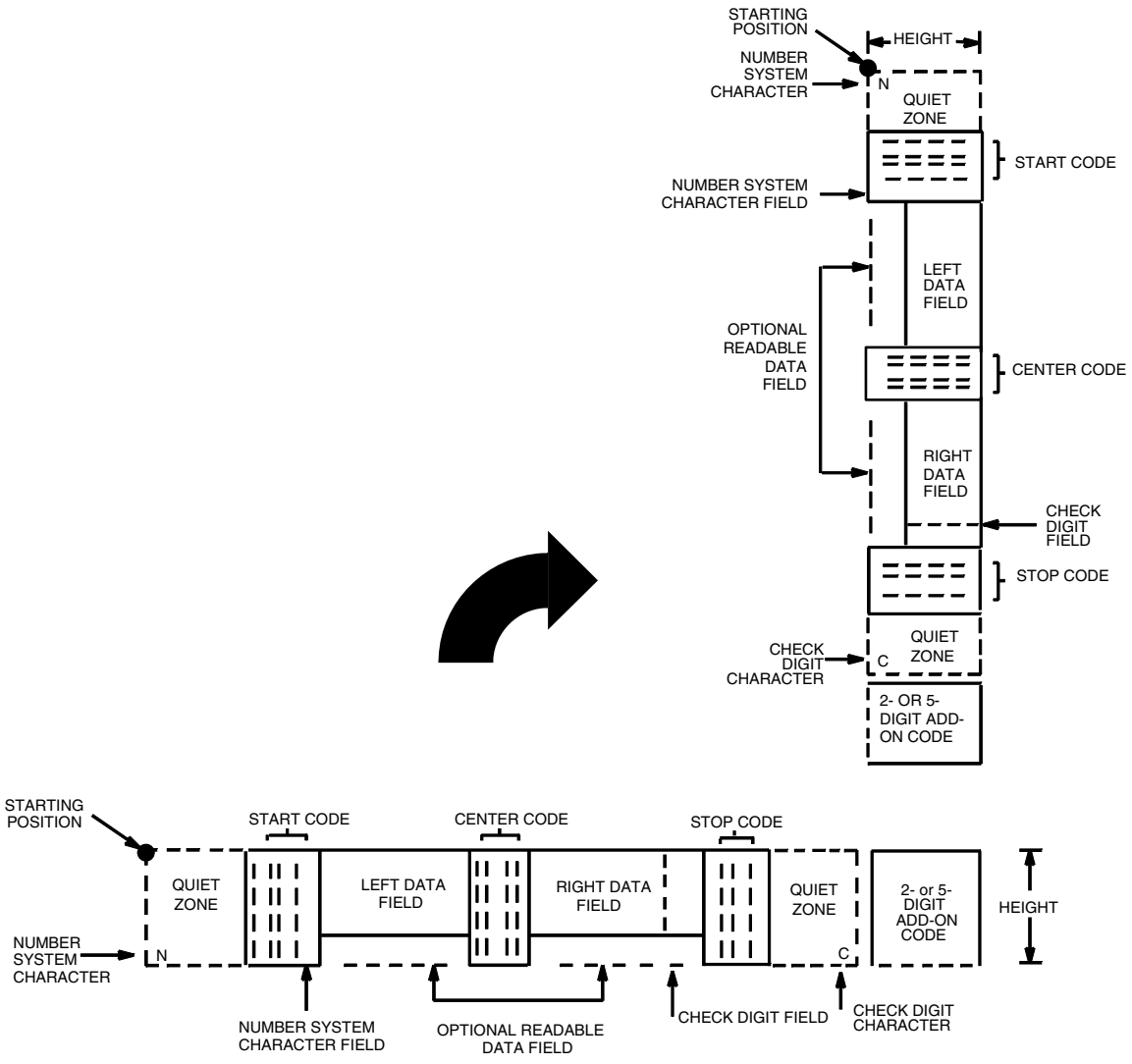


Figure 25. UPC-A Structure

Quiet Zone

Quiet zones extend on both ends of the barcode to permit the scan to begin and end in a blank area. You are responsible for providing sufficient space on the form (minimum of 7 modules) for the right quiet zone. (A trailing quiet zone is provided automatically if an add-on code has been specified in the barcode command.) The number system character is printed automatically in the left quiet zone; the check digit is printed automatically in the right quiet zone.

Start/Center/Stop Codes

The Start/Center/Stop codes are special character codes which extend into the printed data field area, marking the start, center, and stop portions of the barcode. These codes are automatically provided.

Number System Character

The number system character field allows you to apply a code to a class or type of item and is printed in the left quiet zone. The first character in the data field is used as the number system character.

Data Field

The barcode symbol uses a series of varying width bars and spaces to represent a limited character set (numbers 0-9 and Special Characters Start, Center, and Stop). The bars and spaces vary in width from 1 through 4 modules. Each character consists of 2 bars and two spaces that total 7 modules. The symbol coding of the left data field is different from the right data field to permit read direction sensing.

Readable Data

The human readable data field provides a readable interpretation of the barcode data.

Check Digit

The modulo-10 check digit is automatically calculated and inserted in the barcode symbol and printed in the right quiet zone, if specified. The check digit provides the means to verify accurate scanning. The number system character is included in the check digit algorithm.

UPC-A Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p type data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 62 to print the readable data field in the corresponding font with the specified guard band gap.

Table 62. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

NOTE: For UPC 100% PDF is printed in 12 cpi Letter Gothic. For UPC 80% it is printed in 15 cpi Letter Gothic.

9 or : Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type Represents the barcode type. Enter **P** for standard UPC-A; enter **a** for UPC-A plus a 2-digit add-on data field; enter **b** for UPC-A plus a 5-digit add-on data field; enter **0** for UPC-A 80%; enter 1 for UPC-A 100%.

ratio Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. However, unique variable ratios for UPC-A barcodes easily generate large, out-of-spec barcodes. Ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**; VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

UPC-A barcodes use eight-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *1 module wide bar* : *1 module wide space* : *2 module wide bar* : *2 module wide space* : *3 module wide bar* : *3 module wide space* : *4 module wide bar* : *4 module wide space*.

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable bar/space element relationships for barcode readability. When designing unique ratio data, carefully plot bar/space ratios to conform to readable barcodes.

data The barcode data. UPC-A barcodes encode exactly 11 digits. The first character is interpreted as the number system character. The next five characters are the left half of the vendor number data (on the upper side of vertically oriented symbols). The final five characters comprise the right half of the product number data (on the lower side of vertically oriented symbols). A twelfth character is an automatic check digit which is computed and printed in the last character position at the end of the product number data. If the 2- or 5-digit add-on data field is used, include this data at the end of the data field. The characters available for the data field are **0** through **9** (hex 30 through 39).

(cc)G Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

UPC-A Examples

The following command generated the horizontal default ratio UPC-A barcode below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

*^PY^-^M10,10,000^KF^***BYP12345654321^G***^KF^-^PN^-*

^PY^- turned on the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for the data placement.
^KF activated Dark Print.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter P selected the UPC-A barcode type.
12345654321 is the 11-digit barcode data (the first character, 1, is the number system character), and ^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the vertical UPC-A barcode below using standard 10 cpi font with the standard default ratio and data of 12345654321:

*^PY^-^M10,10,000^KF^***CYP12345654321^G***^KF^-^PN^-*

UPC-E

UPC-E barcodes are special zero-suppressed Universal Product Codes that compress 10 data characters down to 6 characters under specific rules. UPC-E barcode types include UPC-E0, UPC-E+2, UPC-E+5, UPC-E0+2, and UPC-E0+5. UPC-E also offers optional extended data fields onto existing UPC-E barcodes. The UPC-E barcode structure is shown in Figure 26 and described on the following pages.

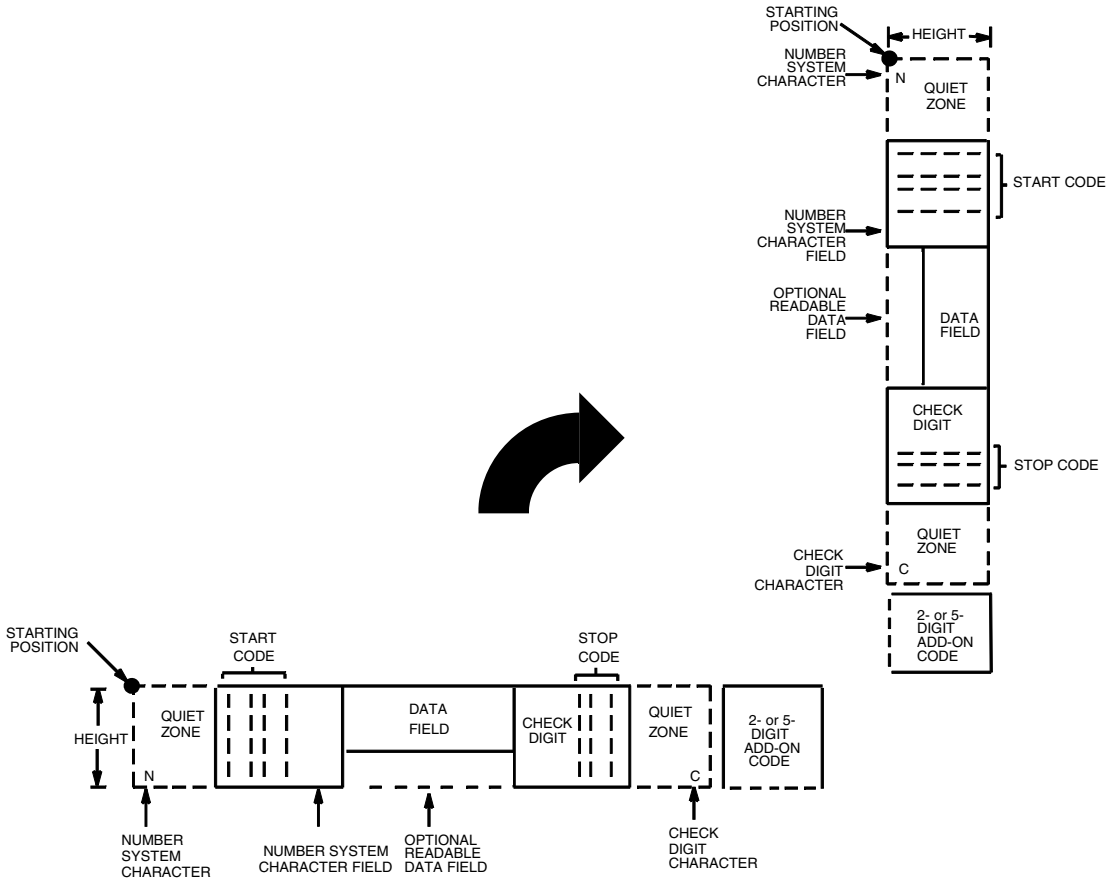


Figure 26. UPC-E Structure

Quiet Zone

Quiet zones extend on both ends of the barcode to permit the scan to begin and end in a blank area. VGL automatically produces an 11-module wide left quiet zone; You are responsible for providing sufficient space (minimum of 7 modules) on the form for the right quiet zone. (A trailing quiet zone is provided automatically if an add-on code has been specified in the barcode command.) The number system character is printed automatically in the left quiet zone. If specified, the check digit is automatically printed in the right quiet zone.

Start/Stop Codes

The Start/Stop codes are special character codes which extend into the printed data field area, marking the start and stop portions of the barcode. These codes are automatically produced.

Number System Character

The number system character field allows you to apply a code to a class or type of item and is printed automatically in the left quiet zone. The first character in the data field is used as the number system character.

Data Field

The barcode symbol uses a series of varying width bars and spaces to represent a limited character set (numbers 0-9 and Special Characters Start and Stop). The bars and spaces vary in width from 1 through 4 modules. Each character consists of 2 bars and 2 spaces that total 7 modules. Six or 10 data characters are expected, depending on the UPC-E barcode type (t) selected. By modifying the syntax of the vendor number and product code, 10-digit data is compressed down to 6 digits.

Readable Data

The human readable data field provides a readable interpretation of the barcode data.

Check Digit

The modulo-10 check digit is automatically calculated and inserted in the barcode symbol and printed in the right quiet zone, if specified. The check digit provides the means to verify accurate scanning. The number system character is included in the check digit algorithm.

UPC-E Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p type data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] *type* [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 63 to print the readable data field in the corresponding font with the specified guard band gap.

Table 63. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or : Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

type Represents the barcode type. Enter the Type Code corresponding to the UPC-E type desired from Table 64.

Table 64. UPC-E Barcodes

Description	Standard Type Code	IBARC, Type Code	# of Data Characters Expected	Number System Used	Default Bar/ Space Ratios*
UPC-E	Q	UPCE	10*	0	1:1:2:2:3:3:4:4
UPC-E0	R	UPCE0	6	0	1:1:2:2:3:3:4:4
UPC-E+2	c	UPCE+2	12*	0	1:1:2:2:3:3:4:4
UPC-E+5	d	UPCE+5	15*	0	1:1:2:2:3:3:4:4
UPC-E0+2	e	UPCE0+2	8	0	1:1:2:2:3:3:4:4
UPC-E0+5	f	UPCE0+5	11	0	1:1:2:2:3:3:4:4
*Type Codes **Q (UPCE)**, **c (UPCE+2)**, and **d (UPCE+5)** compress the data characters down to 6 by applying specific rules according to the syntax of the vendor number data. Refer to the *data* description.					

ratio Optional parameter (used in conjunction with **9** or **:**) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. However, unique variable ratios for UPC-E barcodes easily generate large, out-of-spec barcodes. Ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**; VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

UPC-E barcodes use eight-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *1 module wide bar* : *1 module wide space* : *2 module wide bar* : *2 module wide space* : *3 module wide bar* : 3 *module wide space* : *4 module wide bar* : 4 *module wide space*.

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable bar/space element relationships for barcode readability. When designing unique ratio data, carefully plot bar/space ratios to conform to readable barcodes.

data The barcode data. Depending on the UPC-E barcode selected from Table 64, VGL expects a specific number of data characters to be provided. The characters available for the data field are **0** through **9** (hex 30 through 39).

When Type Code Q, c, or d is selected, 10 data characters are expected; the first five characters are vendor number data, and the next five characters are product code data. The +2 (Type Code c) and +5 (Type Code d) add-on data is unaffected by the compression of the first 10 data characters. The first 10 characters of the data field are automatically modified and compressed down to 6 data characters based on the syntax of the vendor number and product code. The rules for compressing data are described below:

- If the vendor number ends in 000, 100, or 200, then the 6 data characters are: the first 2 vendor numbers, the last 3 product code numbers, and the third vendor number.
- If the vendor number ends in 00, then the 6 data characters are: the first 3 vendor numbers, the last 2 product code numbers, and the digit “3”.
- If the vendor number ends in 0, then the 6 data characters are: the first 4 vendor numbers, the last product code number, and the digit “4”.
- In all other cases, the 6 data characters are: the first 5 vendors numbers and the last product code number.

For example, if the Type Q data field was input as 1232000001, it would be compressed down to 6 characters to read 123214: the first four vendor numbers (1232) are followed by the last product code number (1), and followed by the digit 4, resulting in 123214.

When Type Codes R, e, or f are selected, VGL assumes you have already compressed the first 10 data characters down to 6 characters. The +2 (Type Codes c and e) and +5 (Type Codes d and f) add-on data is unaffected by the compression of the first 10 data characters. The barcode encodes exactly 6 digits.

Note that Type R, Type e, and Type f are UPC-E0 barcodes using encoding tables for 0 number system characters. See Table 65 for compression data from UPC-E to UPC-E0, and see Table 66 for expansion data from UPC-E0 to UPC-E.

(cc)G — Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

Table 65. Ten-Digit Compression

1. Manufacturer's Number					Product Numbers that can be used 00000-00999		
X **X** **X**	**X** **X** **X**	**0** **1** **2**	**0** **0** **0**	**0** **0** **0**	(_ _) first two digits of manufacturer's number	(_ _ _) last three digits of the product number	(_) third digit of the manufacturer's number, use 0 through 2 only

2. Manufacturer's Number					Product Numbers that can be used 00000-00999		
X **X**	**X** **X**	**3** **9**	**0** **0**	**0** **0**	(_ _ _) first three digits of manufacturer's number	(_ _) last two digits of the product number; use 00-99 only	(3) depends on how many digits appear in the manufacturer's number

3. Manufacturer's Number					Product Numbers that can be used 00000-00999		
X	**X**	**X**	**X**	**0**	(_ _ _ _) first four digits of manufacturer's number	(_) last digit of product number, use 0 through 9 only	(4) depends on how many digits appear in the manufacturer's number

4. Manufacturer's Number					Product Numbers that can be used 00000-00999		
X	**X**	**X**	**X**	**X**	(_ _ _ _ _) all five digits of manufacturer's number	(_) last digit of product number, use 5-9 only	

Table 66. Six-Digit Zero Expansion

if the 6 digit number ends with:	then the MFPS number is:	and the Product Number is:
0 Example: 124560	the first 2 digits (of the zero suppressed number) plus 000 12000	00 plus the THIRD, FOURTH and FIFTH digit (of the zero suppressed number) 00456
1 Example: 275831	the first two digits plus 100 27100	same as above 00583
2 Example: 412022	the first two digits plus 200 41200	same as above 00202
3 Example: 876543	the first three digits plus 00 87600	000 plus the FOURTH and FIFTH digit 00054
4 Example: 753774	the first four digits plus 0 75370	0000 plus the FIFTH digit 00007
5, 6, 7, 8, 9 Examples: 213756 517019	the first five digits of the zero suppressed number 21375 51701	0000 plus the SIXTH digit 00006 00009

NOTE: Six digit UPC–EO data ends with 3. The third digit should be ranging from **3** to **9**. An error is printed when anything other than 3 through 9 is entered.

UPC-E Examples

The following command generated the horizontal default ratio UPC-E barcode below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

*^PY^-^M10,10,000^KF^***BYR123456^G**^*KF^-^PN^-*

^PY^- turned on the graphics command sequence.
^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.0 justification value plus 0 additional dots was selected for the data placement.
^KF activated Dark Print.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
Letter R selected the 6-digit, number system 0 UPC-E barcode type.
123456 is the 6-digit barcode data (the first character, 1, is the number system character).
^G terminated the barcode command sequence.
^KF^- at the end of the barcode sequence turned off Dark Print.
^PN^- terminated the graphics mode.

The following command generated the vertical UPC-E barcode below using standard 10 cpi font with the standard default ratio and data of 123456:

*^PY^-^M10,10,000^KF^***CYR123456^G**^*KF^-^PN^-*

UPCSHIP

The UPCSHIP barcode structure is shown in Figure 27 and described on the following pages.

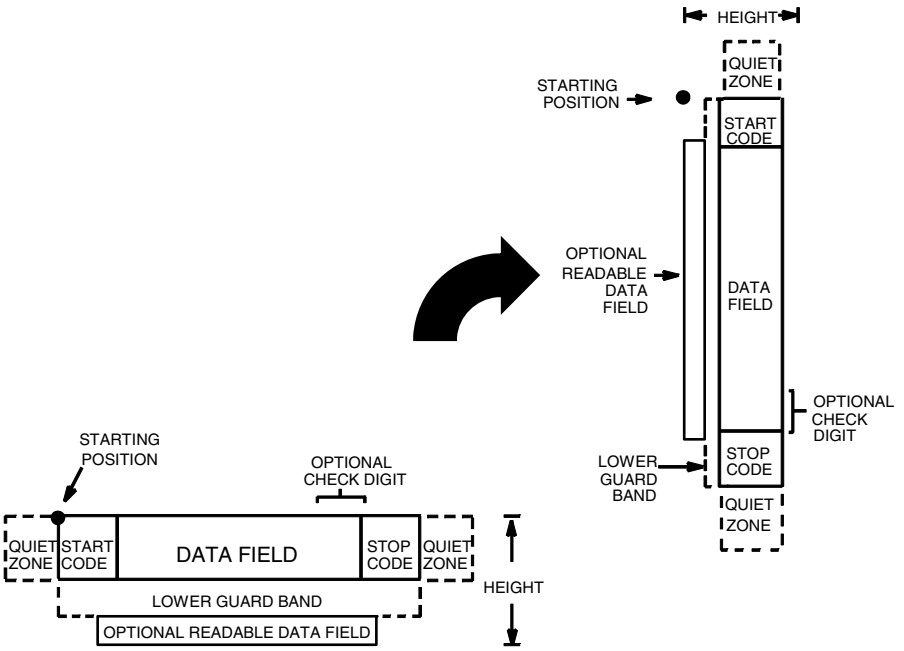


Figure 27. UPCSHIP Structure

Quiet Zone

Both ends of the barcode structure have blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. You are responsible for providing sufficient space on the form for the quiet zones.

Start/Stop Codes

Unique start and stop codes permit bidirectional scanning. Both start and stop codes contain bars and spaces. They are automatically produced.

Data Field

The barcode symbol uses a series of wide and narrow bars and spaces to represent numeric characters. The structure is 2 wide elements (bars or spaces) and 3 narrow elements.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. barcode data is printed below the horizontal barcode symbol and to the left of a vertical barcode symbol. The lower guard band is provided when the readable data field is selected.

Check Digit

The modulo-10 check digit is automatically calculated and inserted in the barcode symbol. The check digit provides the means to verify accurate scanning.

UPCSHIP Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: cc) *dir p* $ *data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] $ [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed in Table 67 to print the readable data field in the corresponding font with the specified guard band gap.

Table 67. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :
Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

$
The type code for UPCSHIP. Enter **$**.

ratio
Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**. VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

UPCSHIP barcodes use four-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space, in dot width, in the following pattern: *narrow bar* : *narrow space* : *wide bar* : *wide space*. For example, enter 2266 in the ratio parameter for:

2 dot-wide narrow bar
2 dot-wide narrow space
6 dot-wide wide bar
6 dot-wide wide space

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable wide/narrow element relationships for barcode readability. For example, VGL accepts wide/narrow ratio values of 2 and 5, respectively; however a narrow element larger than the wide element produces an unreadable barcode. When designing unique ratio data, carefully plot wide and narrow ratios to conform to readable barcodes.

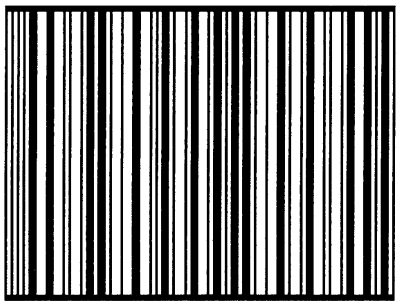
data
The barcode data. The UPCSHIP barcode requires exactly 13 characters of data. The characters available for the data field are **0** through **9** (hex 30 through 39).

(cc)G
Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

UPCSHIP Example

The following command generates the horizontal default ratio UPCSHIP barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

^*M2020*^**IBARC,UPCSHIP,N,0001234567890^G^**-



^M introduced the standard alphanumeric command.
The character height selected was 2.0 inches and character width was selected at 2.0 inches.
^IBARC, introduced the barcode command.
UPCSHIP, selected the UPCSHIP barcode type.
N, selects no readable data field.
0001234567890 is the 13-character barcode data field.
^G^- terminated the barcode command sequence.

UPS 11

The UPS 11 barcode structure is shown in Figure 28 and described on the following pages.

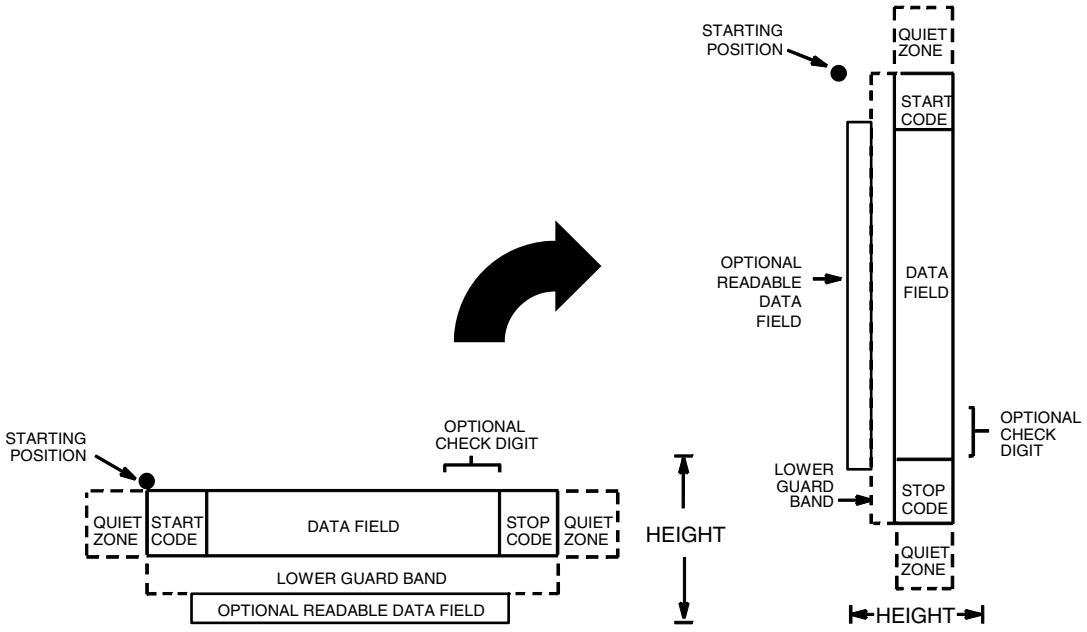


Figure 28. UPS 11 Structure

Quiet Zone

Both ends of the barcode structure require blank quiet zones. The quiet zones must be at least 0.25 inches wide and completely blank to ensure accurate reading of the start/stop codes and to prevent adjacent barcodes from overlapping. Be sure to provide sufficient space on the form for the quiet zones.

Start/Stop Codes

The start/stop codes identify the leading and trailing end of the barcode. Each of the UPS 11 subsets uses a unique start code and a common stop code, both automatically provided by VGL.

Data Field

UPS 11 is a special case of Code 128 (page 195). This barcode is restricted to 10 data characters. The first character must be 0 through 9 or A through Z. The remaining nine digits must be 0 through 9.

Readable Data

The optional readable data field provides a readable interpretation of the barcode data. It can be printed above or below the barcode symbol.

Check Digit

The modulo-103 check digit is automatically calculated and inserted in the barcode symbol. The check digit verifies accurate scanning. The start code is included in the check digit algorithm.

UPS 11 Command Format

NOTE: See page 164 for the IBARC, command format and definitions.

Default Ratio: (cc) *dir p* u *data* (cc)G

Variable Ratio: (cc) *dir p* [9] [:] u [*ratio*] *data* (cc)G

(cc) Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.

dir Represents the direction of the barcode. Enter **B** for horizontal barcodes; enter **C** for vertical barcodes.

p Prints the optional readable data field. The readable data field is printed below a horizontal barcode or on the left-hand side of a vertical barcode.

Replace *p* in the barcode command with one of the codes listed below to print the readable data field in the corresponding font with the specified guard band gap.

Table 68. Printable Data Field Fonts

Font	Gap	*p* code
Standard 10 cpi	3 dots	Y
OCR-A	3 dots	O
OCR-A	.1-inch	S
OCR-B	3 dots	B
OCR-B	.1-inch	T
None		N

9 or :
: Selects the variable ratio length barcode feature, which permits unique bar and space width ratios adjusted for specific applications.

  Enter the number **9** to select variable ratio barcodes represented in line matrix printer dots (60 x 72 dpi).

  Enter **:** to select variable ratio barcodes represented in actual printer dots (203 x 203 dpi or 300 x 300 dpi, depending on the printer head being used).

u
: The type code for UPS 11. Enter **u**.

ratio
: Optional parameter (used in conjunction with **9** or **:** above) representing the ratios for variable ratio barcodes. Default ratios are overridden by the variable ratio feature. The ratio data must be hexadecimal numbers from **0** through **9** or **A** through **F**; VGL automatically checks the input for validity. If an invalid character is found in the ratio, an error message is generated.

  UPS 11 barcodes use eight-digit ratios. The ratios are interpreted from left to right, measuring the size of each bar or space in dot width, in the following pattern: *1 module wide bar* : *1 module wide space* : *2 module wide bar* : *2 module wide space* : *3 module wide bar* : *3 module wide space* : *4 module wide bar* : 4 *module wide space*. For example, enter 22446688 in the ratio data field for:

  2 module wide bar
  2 module wide space
  4 module wide bar
  4 module wide space
  6 module wide bar
  6 module wide space
  8 module wide bar
  8 module wide space

NOTE: VGL automatically checks ratio data for validity only within the allowable hexadecimal range. VGL does not verify that ratio data creates acceptable bar/space element relationships for barcode readability. When designing unique ratio data, carefully plot bar/space ratios to conform to readable barcodes.

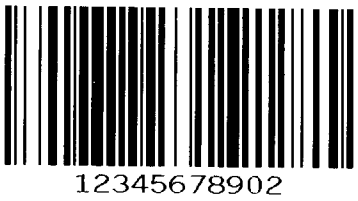
data
: The barcode data. UPS 11 barcodes are restricted to 11 data characters. The first character must be **0** through **9** or **A** through **Z**. The remaining ten digits must be **0** through **9**.

(cc)G
: Terminates the barcode command. Enter the SFCC for your VGL configuration immediately followed by any valid command character or **G**, the universal sequence terminator.

UPS 11 Examples

The following command generates the horizontal default ratio UPS 11 barcode shown below. In the command sequence, graphics mode data is *italicized* and barcode data is **boldface**. See Chapter 2 for a detailed description of alphanumeric commands.

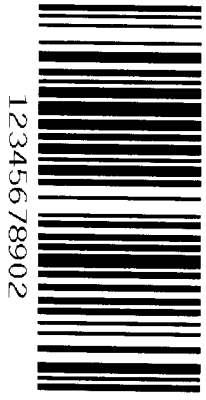
^M1010010^**BYu12345678902^G^-**



^M introduced the standard alphanumeric command.
The character height selected was 1.0 inches and character width was selected at 1.0 inches.
A 0.1 justification value plus 0 additional dots was selected for the data placement.
^B introduced the barcode command.
Y selected the standard 10 cpi font to print the optional readable data field.
u selected the UPS 11 barcode type.
12345678902 is the barcode data field.
^G^- terminated the barcode command sequence.

The following command generated the vertical UPS 11 barcode below using standard 10 cpi font with the standard default ratio and data of 12345678902:

^M1010040^**CYu12345678902^G^-**



4 *Exercises And Examples*

Practice Using VGL

The following examples and exercises are designed to provide experience in using VGL. The VGL command standards used in the exercises are described in Chapter 2. Be sure to specifically follow the format for VGL commands to ensure proper VGL operation.

Most of the format parameters are standard to all the commands unless otherwise noted. Where applicable, some of the practice examples could be modified to use the comparable Version II commands as described in Chapter 2.

The practice exercise is presented for both normal and high resolution modes. The practice exercise for normal resolution begins on page 302. The practice exercise for high resolution begins on page 306.

NOTE: Using a different type of printer or a different configuration could affect the appearance of your printed samples compared to those shown in this manual. Additionally, depending on the paper top-of-form setting and initial print position, the positioning of your printed samples on the page may vary compared to the examples shown here; these samples have been positioned on the page to correspond with the related text.

Use the standard commands on your system to open a file to contain the data, and to print the file when you're ready to print.

An explanation precedes each step in the practice exercises. Each command sequence shows the general command format (**Format**) as detailed in Chapter 2. Data following **Enter** represents the input data. The parameters of each command have a specific order for data entry and a specific amount and type of data that can be entered; input the data exactly as shown with the possible exception of the SFCC. Always use the actual SFCC required by your system wherever the ^ is shown.

Practice Graphic Exercise - Normal Resolution

NOTE: It is not necessary to enter the Dark Print (KF) commands where instructed in the practice exercise steps. Dark Print is a feature of line matrix printers only.

Creating Alphanumeric Text

1. Enable VGL for the Graphics Mode using the Graphics Mode Enable command (PY). This is the first input to change VGL from the Normal Mode to the Graphics Mode before any graphics data or commands can be processed.

Format: (cc)PY(cc)-

Enter: ^PY^-

2. To avoid accidentally terminating the graphics command sequences by a host-generated terminator, enable the Free Format command (F). This allows VGL to accept the data as one continuous stream even though the data may contain host-generated paper motion commands. When Free Format is enabled, VGL only recognizes the Free Format command terminators: carriage return (^-), form feed (^,), line feed (^*), vertical tab (^+), and EVFU commands.

Format: (cc)F(cc)-

Enter: ^F^-

3. Create some alphanumeric text. Use the Standard Alphanumeric command (M) to print "IGP" in characters 1.0 inches high (*ht*) and 1.0 inches wide (*wd*). Add a pass terminator (carriage return).

Format: (cc)M *ht wd jus data*
(cc)-

Enter: ^M10,10,000IGP
^-

4. To see the results, enter a sequence terminator. For example, enable the Free Format Form Feed command (,) and print the file. The result should look like the example shown in Figure 29.

Format: (cc),

Enter: ^,

Figure 29. Practice Alphanumeric Commands in Normal Resolution

Boxing the Alphanumeric Text

5. In order to put a box around "IGP," a certain amount of data positioning must occur. Modify the standard alphanumeric command (M) previously entered to include other commands before "IGP." Add a Justification command (J) for a 1.2 inch justification (*jus*) to move "IGP" down. Add a Horizontal Tab (T) command before "IGP" to move it 1.1 inches (*dis*) from the left margin.

Format: (cc)M *ht wd jus*
(cc)J *jus* (cc)T *dis data*

Enter: ^M10,10,000
^J120^T0110IGP

6. Use the Box command (LB) to add the box around "IGP." The Box command is part of the extended graphics command set; in this example, it must be input as part of the alphanumeric command sequence (input prior to the sequence terminator). Use a Horizontal Tab command (T) to position the starting point of the box 0.9 inches (*dis*) from the left margin. Use a Justification command (J) with a zero justification to begin the box at the top of the form. Enter the Box command (LB) to create a box 4.2 inches wide (*horz*) and 2.5 inches tall (*vert*) with horizontal (*h*) and vertical (*v*) borders 3 dot rows thick.

Format: (cc)T *dis*
(cc)LB *horz vert h v*

Enter: ^T0090^J000
^LB0420,0250,3,3

The input file now contains the following commands. Printing the file creates a box around the name as shown in Figure 30.

```
^PY^-
^F^-
^M10,10,000
^J120^T0110IGP
^T0090^J000
^LB0420,0250,3,3
^-^,
```

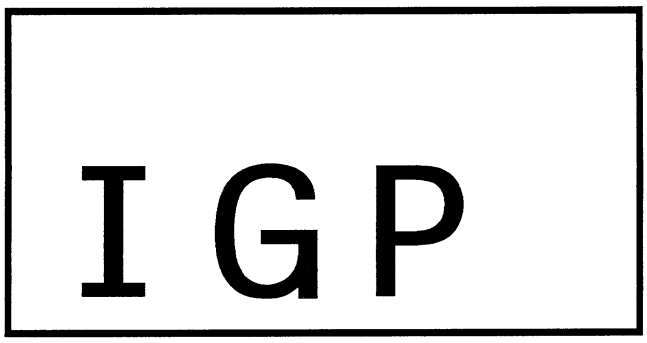


Figure 30. Practice Alphanumeric Commands and Box in Normal Resolution

Creating Horizontal Lines

7. To put a horizontal line under “IGP,” use another Justification (J) and Horizontal Tab (T) sequence to position the line 2.3 inches (*jus*) down which is 0.3 inches under the name. Tab the line to 1.0 inches (*dis*) from the left margin which begins the line just inside the left edge of the box. Use a Solid Line (LS) command to create a line 3.0 inches long horizontally (*horz*) and 2 dots wide vertically (*vert*). Add this data to the file before the sequence terminator. The printed result is shown in Figure 31.

Format: (cc)J *jus* (cc)T *dis*
(cc)LS *horz vert h v*

Enter: ^J230^T0100
^LS0300,0002

Figure 31. Practice Alphanumeric Commands, Box, and Line in Normal Resolution

Creating More Alphanumeric Text

8. Use the Character Height command (H) to specify a new height (*ht*) of 0.2 inch. Use the Character Width command (W) to specify a new width (*wd*) of 0.3 inches. Use a Justification command (J) to position the word "INTELLIGENT" (*data*) at 0.1 inches (*jus*) from the starting position and a Horizontal Tab command (T) to position "INTELLIGENT" 1.1 inches (*dis*) from the left margin. Similarly, using the Justification and Tab sequence, the word "GRAPHICS" can be positioned 0.4 inches down, 1.6 inches from the left margin, and the word "PRINTING" 0.7 inches down, 2.1 inches from the left margin. Notice how it is possible to tab and justify to any position. Tabs are related to the left margin and can be specified in any print position left or right of the current print position. Justification is relative to the starting point of the command sequence and can move down and back up relative to that point.

Format: (cc)H *ht* (cc)W *wd*
(cc)J *jus* (cc)T *dis data*

Enter: ^H02^W03
^J010^T0110INTELLIGENT
^J040^T0160GRAPHICS
^J070^T0210PRINTING

9. Disable the Free Format command (O) and use the Graphics Mode Disable command (PN).

Format: (cc)O(cc)-(cc)PN(cc)-

Enter: ^O^-^PN^-

The file now contains the following commands. The printout is shown in Figure 32.

```
^PY^-
^F^-
^M10,10,000
^J120^T0110IGP
^T0090^J000
^LB0420,0250,3,3
^J230^T0100
^LS0300,0002
^H02^W03
^J010^T0110INTELLIGENT
^J040^T0160GRAPHICS
^J070^T0210PRINTING
^-^,
^O^-^PN^-
```

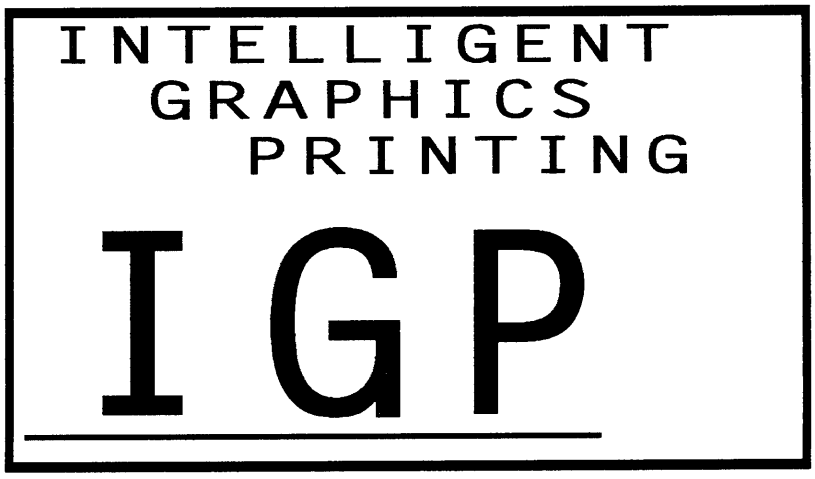


Figure 32. Completed Practice Example in Normal Resolution

Practice Graphic Exercise - High Resolution

The high resolution practice exercise is very similar to the normal resolution exercise; the difference is that some parameters have been expanded to allow sizing and positioning at greater levels of specificity (higher resolution). Again, remember to properly terminate each command line and be sure that the printer power is on and that the printer is ready and on line.

Enable VGL Graphics

1. Enable VGL for the Graphics Mode using the Graphics Mode Enable command (PY). This is the first input to change VGL from the Normal Mode to the Graphics Mode.

Format: (cc)PY(cc)-

Enter: ^PY^-

2. To avoid accidentally terminating the graphics command sequence by a host-generated terminator, enable the Free Format command (F). This allows VGL to accept the data as one continuous stream even though the data may contain host-generated paper motion commands. When Free Format is enabled, VGL only recognizes the Free Format command terminators: Carriage Return (^-), Form Feed (^,), Line Feed (^*), Vertical Tab (^+), and EVFU commands.

Format: (cc)F(cc)-

Enter: ^F^-

3. Once in Graphics Mode, type the following command to enable Extended Graphics/High Resolution Mode:

Format: ^IPARAM,(mode)^G^-

Enter: ^IPARAM,EXTENDED^G^-

4. Create some alphanumeric text. Use the Standard Alphanumeric command (M) to print "IGP" in characters 1.25 inches high (*ht*) and 1.25 inches wide (*wd*). Add a pass terminator (carriage return).

Format: (cc)M *ht wd jus data*
(cc)-

Enter: ^M125,125,00000IGP
^-

5. To see the results, enter a sequence terminator. For example, enable the Free Format Form Feed command (,) and print the file. The result should look like the example shown in Figure 33.

Format: (cc),

Enter: ^,

Figure 33. Practice Alphanumeric Commands in High Resolution

Boxing the Alphanumeric Text

6. In order to put a box around "IGP," a certain amount of data positioning must occur. Modify the standard alphanumeric command (M) previously entered to include other commands before "IGP." Add a Justification command (J) for a .525 inch justification (*jus*) to move "IGP" down. Add a Horizontal Tab (T) command before "IGP" to move it 1.125 inches (*dis*) from the left margin.

Format: (cc)M *ht wd jus*
(cc)J *jus* (cc)T *dis data*

Enter: ^M125,125,00000
^J00525^T01125IGP

7. Use the Box command (LB) to add the box around "IGP." The Box command is part of the extended graphics command set; in this example, it must be input as part of the alphanumeric command sequence (input prior to the sequence terminator). Use a Horizontal Tab command (T) to position the starting point of the box .925 inches (*dis*) from the left margin. Use a Justification command (J) with a zero justification to begin the box at the top of the form. Enter the Box command (LB) to create a box 4.225 inches wide (*horz*) and 2.525 inches tall (*vert*) with horizontal (*h*) and vertical (*v*) borders 1 dot row thick.

Format: (cc)T *dis*
(cc)LB *horz vert h v*

Enter: ^T00925^J00000
^LB04225,02525,1,1

The input file now contains the following commands. Printing the file creates a box around the name as shown in Figure 34.

```
^PY^-
^F^-
^IPARAM,EXTENDED^G^
^M125,125,00000
^J00525^T01125IGP
^T00925^J00000
^LB04225,025525,1,1
^-^
```

,

Figure 34. Practice Alphanumeric Commands With a Box in High Resolution

Creating Horizontal Lines

8. Use another Justification (J) and Horizontal Tab (T) sequence to place a horizontal line under “IGP.” Position the line 2.025 inches (*jus*) down, which is 1.5. inches under the name. Tab the line to 1.525 inches (*dis*) from the left margin which begins the line just inside the left edge of the box. Use a Solid Line (LS) command to create a line 2.925 inches long horizontally (*horz*) and 0.005 inches wide vertically (*vert*). Add this data to the file before the sequence terminator. The printed result is shown in Figure 35.

Format: (cc)J *jus* (cc)T *dis*
(cc)LS *horz vert h v*

Enter: ^J02025^T01525
^LS02925,00005

Figure 35. Practice Alphanumeric Commands, Box, and Line in High Resolution

Creating More Alphanumeric Text

9. Use the Character Height command (H) to specify a new height (*ht*) of .012 inch. Use the Character Width command (W) to specify a new width (*wd*) of .012 inches. Use a Justification command (J) to position the word "INTELLIGENT" (*data*) at .135 inches (*jus*) from the starting position and a Horizontal Tab command (T) to position it 1.125 inches (*dis*) from the left margin. Similarly, using the Justification and Tab sequence, the word "GRAPHICS" can be positioned .245 inches down, 2.550 inches from the left margin, and the word "PRINTING" .355 inches down, 3.775 inches from the left margin.

   Notice how it is possible to tab and justify to any position. Tabs are related to the left margin and can be specified in any print position left or right of the current print position. Justification is relative to the starting point of the command sequence and can move down and back up relative to that point.

   Format: (cc)H *ht* (cc)W *wd*
   (cc)J *jus* (cc)T *dis data*

   Enter: ^H012^W012
   ^J00135^T01125INTELLIGENT
   ^J00245^T02550GRAPHICS
   ^J00355^T03775PRINTING

10. Disable the Free Format command (O) and use the Graphics Mode Disable command (PN) to disable the Graphics Mode (and thus the Extended Graphics/High Resolution Mode) to complete this exercise.

Format: (cc)O(cc)-(cc)PN(cc)-

Enter: ^O^-^PN^-

The file now contains the following commands. The printout is shown in Figure 36.

```
^PY^-
^F^-
^IPARAM,EXTENDED^G^-
^M125,125,00000
^J01525^T01125IGP
^T00925^J00000
^LB04225,02525,1,1
^J02025^T01525
^LS02925,00005
^H012^W012
^J00135^T01125INTELLIGENT
^J00245^T02550GRAPHICS
^J00355^T03775PRINTING
^-^,
^O^-^PN^-
```

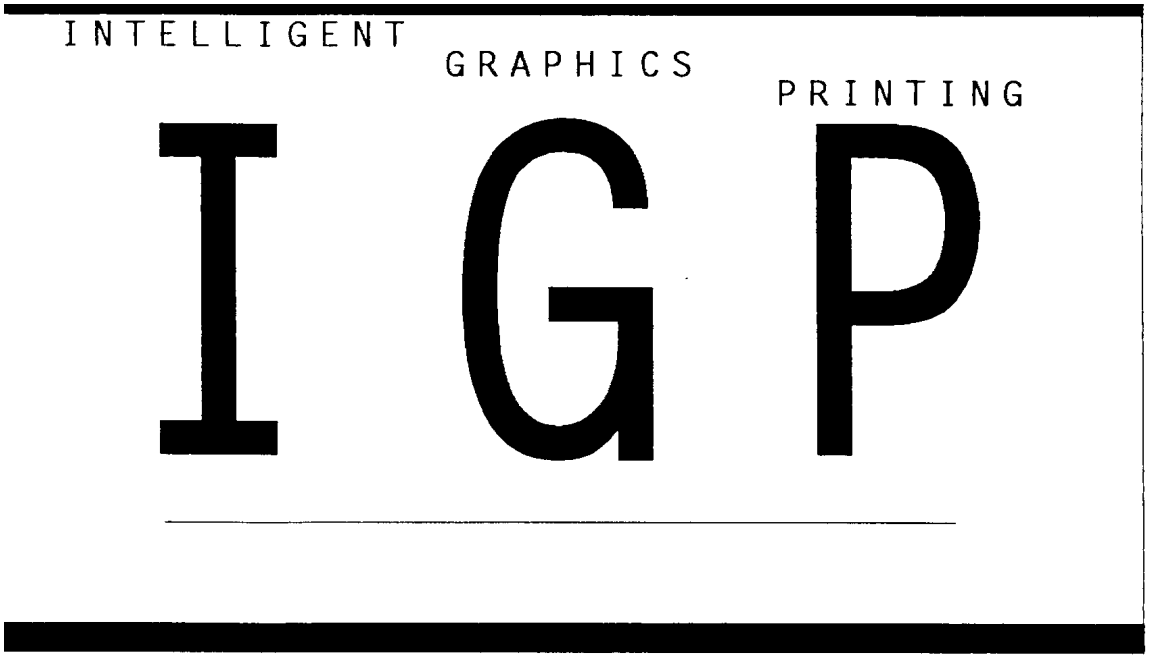


Figure 36. Completed Practice Example in High Resolution

Once familiar with the expanded command parameters used in high resolution mode, you can perform the remaining exercises in high resolution mode also. To do so, simply enable Extended Graphics/High Resolution Mode as you did in this exercise and then modify the appropriate steps in the exercises to include broader parameter definitions.

Form Example

The following exercise produces a complete form by sketching it out on a grid. (Use the Standard Grid and Logo grid provided in Appendix C.) The starting and ending values are the data for VGL command parameters. The form includes a box, a logo, a barcode, vertical and horizontal lines and alphanumeric data.

Page Layout Considerations

At 6 lines per inch (lpi) and 10 characters per inch (cpi) printing, a standard 8-1/2 x 11-inch sheet of paper has a print area of 66 lines (rows) and 85 characters (columns). (The printable area varies if you are not printing at 6 lpi and 10 cpi.) Thus, the grid used to design an 8-1/2 x 11-inch form should accommodate this 66 x 85 area.

Planning the Form Layout

In this example, assume you work for the HandCraft Boat Company. Your slogan is "Quality boats crafted by hand," and the owner, Mr. Handcraft, has asked you to design a simple form that his salesman can use for special orders. On the form, he wants a logo, the slogan, the customer's name, spaces for other particulars of the order, and a barcode to distinguish the sales region and boat division from other HandCraft enterprises. Begin your task as described below.

All data and commands for the form are entered into a file on the host computer. Again, use the standard commands on your system to open a file to contain the data and to print the file.

Similar to the previous examples, the information you are to input is listed under the word **Enter**. Input the data exactly as it is shown with the possible exception of the SFCC. Always use the actual SFCC required by your system wherever the ^ is shown. For each command sequence, the general command format is listed under the word **Format**. In the general format, the SFCC is shown as (cc).

Remember to properly terminate each command line. Make sure the printer power is on and that the printer is ready and on line.

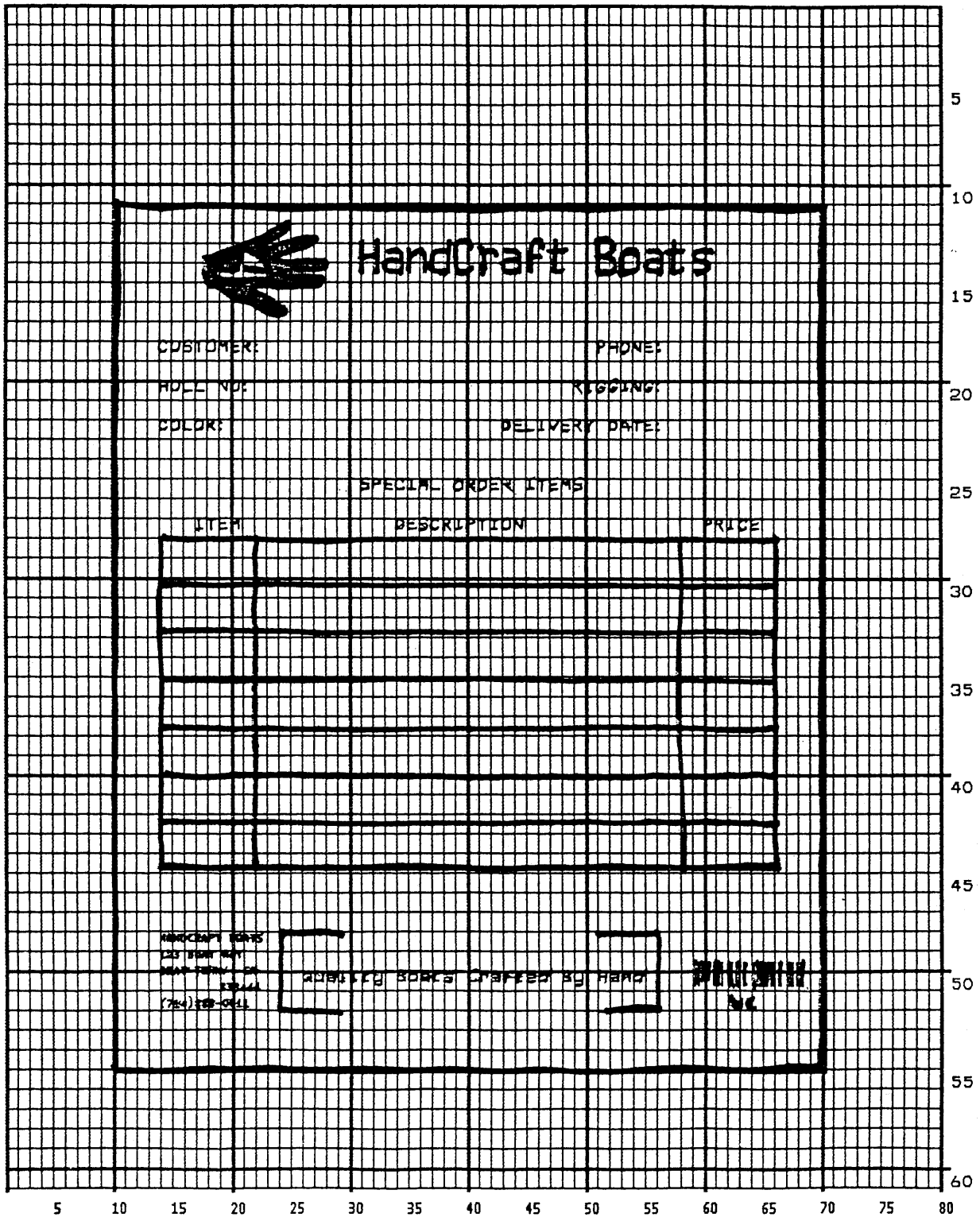


Figure 37. Sample Form Design

Design the Form

1. Design the form on a grid as shown in Figure 37. (A standard grid program and example is provided in Appendix C.) Designing the form on the grid allows you to decide where each form element is placed. Compensate for expanded alphanumerics and plan for the logo.

Enable VGL Graphics

2. Use the Graphics Mode Enable command (PY) to enable VGL for the Graphics Mode.

Format: (cc)PY(cc)-

Enter: ^PY^-

3. To avoid accidentally terminating the graphics command sequence by a host-generated terminator, enable the Free Format command (F). This allows VGL to accept the data as one continuous stream even though the data may contain host-generated paper motion commands. When Free Format is enabled, VGL only recognizes the Free Format command terminators: Carriage Return (^-), Form Feed (^,), Line Feed (^*), Vertical Tab (^+), and EVFU commands.

Format: (cc)F(cc)-

Enter: ^F^-

4. Send a Free Format Form Feed command (,), to begin form processing at a top-of-form position.

Format: (cc),

Enter: ^,

VGL is now ready to accept the commands and data for the form. Most of the form and form elements are designed using the extended graphics command set. Consequently, one of the Alphanumeric commands or the Interrupt command must be used to introduce, or enable, the extended graphics commands.

5. Enter the Standard Alphanumeric command (M). No other Alphanumeric command parameters are needed at this time.

Format: (cc)M

Enter: ^M

Position Form Elements

6. Each of the various form elements must be properly positioned within the form. Use a Justification command (J) to adjust the vertical position and a Horizontal Tab command (T) to adjust the horizontal position for the first form element. Position the first element 1.1 inches (*jus*) down from the current print position and 1.0 inches (*dis*) in from the left margin.

Format: (cc)J *jus* (cc)T *dis*

Enter: ^J110^T0100

Create the Box Around the Form

7. Use the Box command (LB) to create the outer box of the form. The box will be 6.0 inches wide (*horz*), 7.4 inches tall (*vert*), with a 3-dot horizontal (*h*) and vertical (*v*) line thickness.

Format: (cc)LB *horz vert h v*

Enter: ^LB0600,0740,3,3

Design the Logo

8. Define the logo, and return to the form to add the logo data. The HandCraft logo is a hand with a sailboat as plotted in Figure 38. (Use the Logo Grid in Appendix C to plot the dot positions for your logo the same way.) Drawing the logo out on a grid permits the dot positions for each vertical data byte in the logo to be computed and input as data in the Plotting Graphics (Q) command. Notice that where dot positions are *not* computed, the boat image in the hand emerges. The complete program for the HandCraft logo starts on page 317.

Translate Logo Design into Data

Each hexadecimal data byte specifies a seven-bit dot row portion of the logo, measuring 0.1 inch. The Most Significant Bit (MSB) of the data byte corresponds to row 1 (the top bit row), and the bit rows continue through the other bits to the Least Significant Bit (LSB) of the data byte, which corresponds to row 1 (the bottom row). If the bit is set, a dot is printed in the corresponding location. A hex data byte value of 7F prints dots in all seven rows (64 + 32 + 16 + 8 + 4 + 2 + 1); a hex value of 40 (decimal 64) prints a dot only in bit row 7. See page 129 in Chapter 2 for more information on the Graphics Plotting (Columns) command.

For example, the values in Table 69 have been assigned to bits 1 through 7 for the first 0.1-inch row of data bytes (1 through 42) shown in Figure 38. Each byte was first calculated in decimal and then converted to the equivalent hexadecimal value (using the ASCII chart in Appendix A). The hexadecimal values are the data for the program shown on page 317.

Following this scheme, all hex data bytes for an entire 0.1 inch row (seven vertical dot rows) of the logo can be calculated. Subsequent rows are calculated similarly. To print each 0.1-inch row of the logo, the print position is shifted down 0.1 inch using the Justification command, and then the same vertical data byte columns are used. (See the second example in Figure 38.)

Use the extended command for Graphics Plotting in columns (Q). The Standard Alphanumeric command (M) introduces the Q command. The Standard Alphanumeric command is also required with the Justification (J) command to begin printing the logo 1.2 inches (*jus)* down from the original print position and subsequently adjusted 0.1 inches with each row. The Horizontal Tab (T) command is used to begin logo printing 1.7 inches and 5 dot rows (*dis*) from the left margin.

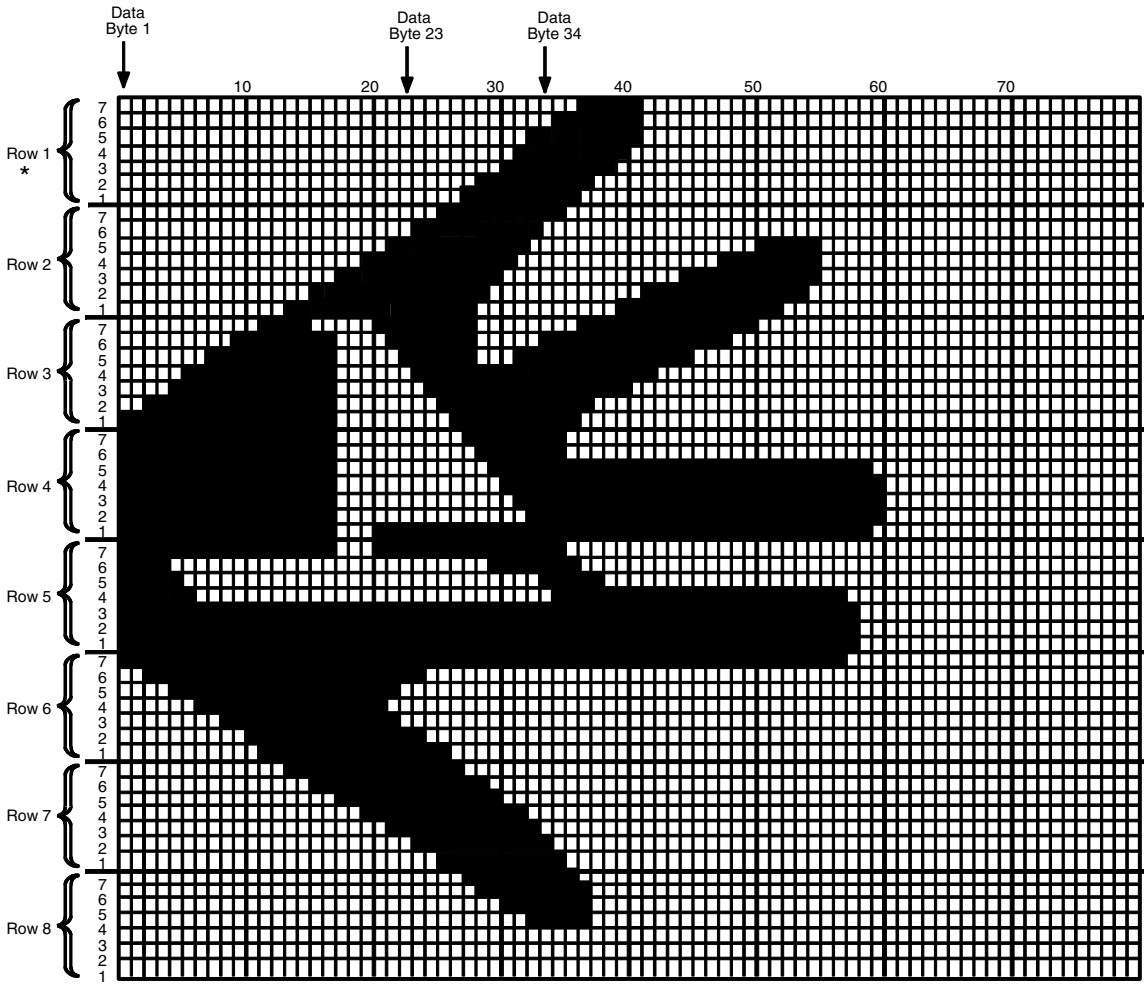
Table 69. Translating Logo Design Into Data

Data Byte #	Decimal Value	Converted to Hexadecimal Value
1 through 27	00	00
28	01	01
29	03	03
30	03	03
31	07 (4+2+1)	07
32	15 (8+4+2+1)	0F
33	31 (16+8+4+2+1)	1F
34	31	1F
35	63 (32+16+8+4+2+1)	3F
36	63	3F
37	126 (64+32+16+8+4+2)	7E
38	124 (64+32+16+8+4)	7C
39	124	7C
40	120 (64+32+16+8)	78
41	112 (64+32+16)	70

NOTE: Data Bytes containing no value (00), such as bytes 1 through 27 above, must be listed when actual data follows. However, any remaining 00 data bytes following the *end* of data for that line, such as bytes 42 through 80, need not be listed. (The universal terminator, (cc)G, signals the end of data for that line.)

Following this scheme, all hex data bytes for an entire 0.1 inch row (seven vertical dot rows) of the logo can be calculated. Subsequent rows are calculated similarly. To print each 0.1-inch row of the logo, the print position is shifted down 0.1 inch using the Justification command, and then same vertical data byte columns are used. (See the second example in Figure 38 on page 316.)

Use the extended command for Graphics Plotting in columns (Q). The Standard Alphanumeric command (M) introduces the Q command. The Standard Alphanumeric command is also required with the Justification (J) command to begin printing the logo 1.2 inches (*jus*) down from the original print position and subsequently adjusted 0.1 inches with each row. The Horizontal Tab (T) command is used to begin logo printing 1.7 inches and 5 dot rows (*dis*) from the left margin.



NOTE: Actual size of this logo is approximately .8-inch tall by 1-inch wide.
*Each 7-bit vertical data byte equals .1-inch or 1 “row”.

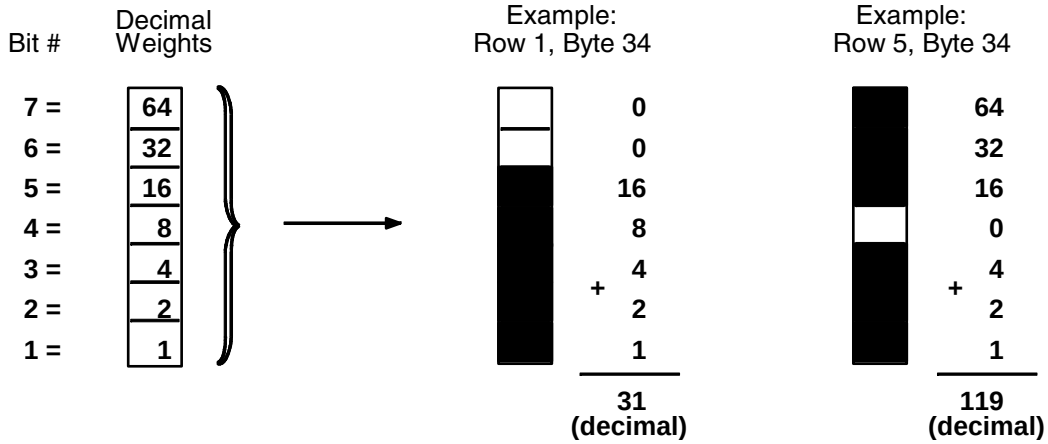


Figure 38. Logo Design

Input the Logo Data

9. Input the command sequence for the Standard Alphanumeric command, Justification command, Horizontal Tab command, and Graphics Plot command for each 0.1-inch row of hex data in the logo. Each group of data below represents, from top to bottom, the eight 0.1-inch rows required to produce the logo. (The spaces separating each group are for readability; do not include these spaces in your program.)

Format:

(cc)M(cc)J *jus* (cc)T *dis* (cc)Q *data* (cc)G

Enter:

^M^J120^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,
00,00,00,01,03,03,07,0F,1F,1F,3F,3F,7E,7C,7C,78,70^G

Enter:

^M^J130^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,01,01,03,03,07,07,0F,0F,1F,1F,3F,
3F,7F,7F,7F,7E,7C,78,70,60,40,40,00,00,00,00,01,01,03,03,03,07,07,07,0F,
0F,0F,1F,1F,1E,1E,1C^G

Enter:

^M^J140^T0175^Q
01,01,03,03,07,0F,0F,1F,1F,3F,3F,7F,7F,7F,7F,3F,3F,00,00,00,40,60,70,78,
7C,7E,7F,7F,0F,0F,0F,1F,1F,3F,3F,3F,7E,7C,7C,7C,78,78,70,70,70,60,60,
60,40,40^G

Enter:

^M^J150^T0175^Q
7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,00,00,00,01,01,01,01
,01,01,01,41,61,71,79,7D,7F,7F,7F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,
1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,0E^G

Enter:

^M^J160^T0175^Q
7F,7F,7F,7F,5F,4F,47,47,47,47,47,47,47,47,47,47,47,07,07,07,47,47,47,47,
47,47,47,47,47,67,67,67,67,77,7F,3F,1F,1F,0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,
0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,07^G

Enter:

^M^J170^T0175^Q
40,40,60,60,70,70,78,78,7C,7C,7E,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,77,63,63
,41,41,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,
40,40,40,40,40,40,40,40,40^G

Enter:

^M^J180^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,40,40,60,60,70,70,78,78,7C,7C,7E,
7E,7F,7F,3F,3F,1F,0F,0F,07,03,01^G

Enter:

```
^M^J190^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,0
0,00,00,40,60,60,70,70,78,78,78,78,38^G
```

Enter the Company Heading

10. Next to the logo, print the company name, HandCraft Boats, in characters 0.3 inches high (*ht*) and 0.2 inches wide (*wd*) using the Standard Alphanumeric command (M). Position the name 1.2 inches and 9 dot rows (*jus*) down from the current print position, using the Justification parameter of the Alphanumeric command and 3.1 inches (*dis*) from the left margin using the Horizontal Tab (T) command. An Interrupt command (I) is a most efficient way to input this type of data into various locations on the form and it is used frequently in the remainder of the form processing. Using the Interrupt command (followed by a Graphics Mode carriage return), we can print what we have programmed so far, then move the print position to 2.2 inches (*dis*) below the current start position.

Format: (cc)M *ht wd jus* (cc)T *dis data* (cc)G
(cc)I *dis* (cc)-

Enter:
```
^M03,02,129^T0310HandCraft Boats^G
^I220^-
```

The file on the host system for this form to this point contains all the information listed below. Use your system standard command format to print the file. The form should look like the one shown in Figure 39. If errors occur, review your input and see Chapter 6.

```
^PY^-
^F^-
^,
^M
^J110^T0100
^LB0600,0740,3,3
^M^J120^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,
00,00,00,01,03,03,07,0F,1F,1F,3F,3F,7E,7C,7C,78,70^G
^M^J130^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,01,01,03,03,07,07,0F,0F,1F,1F,3F,
3F,7F,7F,7F,7E,7C,78,70,60,40,40,00,00,00,00,01,01,03,03,03,07,07,07,0F,
0F,0F,1F,1F,1E,1E,1C^G
^M^J140^T0175^Q
01,01,03,03,07,0F,0F,1F,1F,3F,3F,7F,7F,7F,7F,3F,3F,00,00,00,40,60,70,78,
7C,7E,7F,7F,0F,0F,0F,1F,1F,3F,3F,3F,7E,7C,7C,7C,78,78,70,70,70,60,60,
60,40,40^G
^M^J150^T0175^Q
7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,00,00,00,01,01,01,01
,01,01,01,41,61,71,79,7D,7F,7F,7F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,
1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,0E^G
^M^J160^T0175^Q
7F,7F,7F,7F,5F,4F,47,47,47,47,47,47,47,47,47,47,47,07,07,07,47,47,47,47,
47,47,47,47,47,67,67,67,67,77,7F,3F,1F,1F,0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,
0F,0F,0F,0F,0F,0F,0F,0F,0F,07^G
```

```
^M^J170^T0175^Q
40,40,60,60,70,70,78,78,7C,7C,7E,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,77,63,63
,41,41,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,
40,40,40,40,40,40,40,40,40^G
^M^J180^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,40,40,60,60,70,70,78,78,7C,7C,7E,
7E,7F,7F,3F,3F,1F,0F,0F,07,03,01^G
^M^J190^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,
00,00,00,40,60,60,70,70,78,78,78,78,38^G
^M03,02,129^T0310HandCraft Boats^G
^I220^-
```

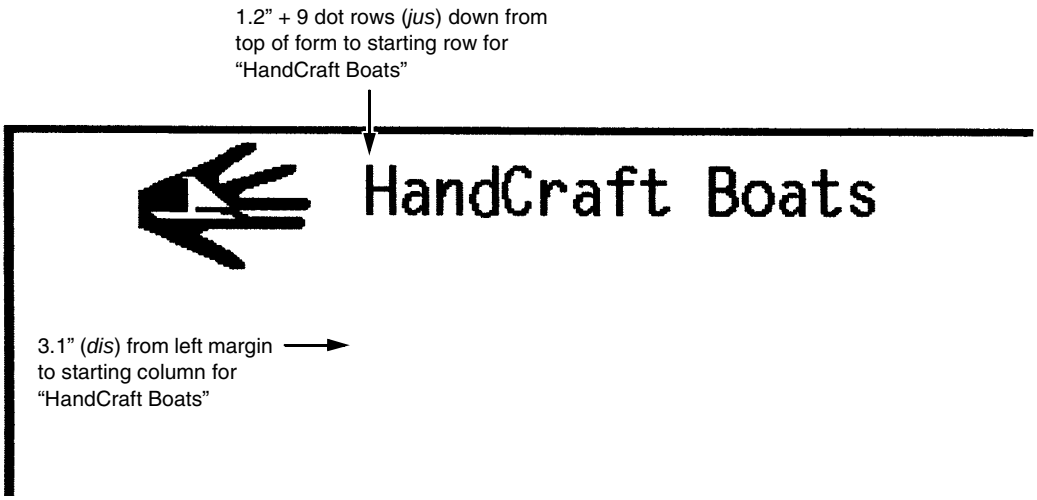


Figure 39. Box, Logo, and Alphanumeric Commands

Enter Alphanumeric Text Throughout the Form

11. Create the customer related information on the top portion of the form. Send the Standard Alphanumeric command (M) to specify 0.1 inch high (ht) and 0.1 inch wide (*wd*) characters. With the Horizontal Tab command (T), position the CUSTOMER: data 1.5 inches (*dis*) from the left margin and position the PHONE: data 5.1 inches (*dis*) from the left margin.

Format: (cc)M *ht wd jus data*
(cc)T *dis data*

Enter: ^M01,01,000
^T0150CUSTOMER:^T0510PHONE:

12. Other pieces of the customer type data can be added to the top part of the form from within the same alphanumeric command sequence initiated in the previous step. Using a Justification command (J), the print position can be lowered 0.4 inches (*jus*). Using Horizontal Tab commands (T), the HULL NO: data can be positioned 1.5 inches (*dis*) from the left margin

and the RIGGING: data can be positioned 4.9 inches (*dis*) from the left margin.

Format: (cc)J *jus*
(cc)T *dis data*

Enter: ^J040
^T0150HULL NO:^T0490RIGGING:

13. The next set of customer data can be input in a similar fashion. Use the Justification command (J) to move the print position down 0.8 inches (*jus*), use the Horizontal Tab command (T) to position the COLOR: data 1.5 inches (*dis*) from the left margin and the DELIVERY DATE: data 4.4 inches (*dis*) from the left margin.

Format: (cc)J *jus*
(cc)T *dis data*

Enter: ^J080
^T0150COLOR:^T0440DELIVERY DATE:

14. The remaining text on the top portion of the form can now be entered, again using a combination of Justification (J) and Horizontal Tab (T) commands. Begin by justifying the print position 1.4 inches (*jus*) down and tabbing 3.2 inches (*dis*) from the left margin for the SPECIAL ORDER ITEMS heading.

    Justify the print position 1.8 inches (*jus*) and tab 1.7 inches (*dis*) for the ITEM heading, 3.5 inches (*dis*) for the DESCRIPTION heading, and 6.0 inches (*dis*) for the PRICE heading. Notice that the Justification command always moves the print position relative to the last printed row position of the alphanumeric command sequence. For this reason, the SPECIAL ORDER ITEMS heading justified at 1.4 inches is 0.4 inches above the ITEM, DESCRIPTION, and PRICE headings justified at 1.8 inches.

    Similarly, the Horizontal Tab command moves the print position relative to the left margin. Unlike a conventional typewriter, this allows you to move the print position to the left or the right of the current position by specifying a different tab position relative to the left margin.

    Use the Interrupt command (I) followed by a Graphics Mode carriage return (-) to position this part of the form 2.0 inches (*dis*) from the previously active graphics command sequence (the sequence that constructed the customer data).

Format: (cc)J *jus*
(cc)T *dis data*
(cc)I *dis* (cc)-

Enter: ^J140
^T0320SPECIAL ORDER ITEMS
^J180
^T0170ITEM^T0350DESCRIPTION^T0600PRICE
^I200^-

Enter the Interior Box with Horizontal and Vertical Lines

15. Add the interior form (the box with vertical lines) for the item, description, and price data. VGL Form command constructs a box complete with vertical lines at specified positions.

    A Standard Alphanumeric command (M) sequence must be entered to introduce the extended graphics commands that are used. Use a Horizontal Tab command (T) to move the print position 1.5 inches (*dis*) from the left margin. In the same sequence, use the Form command (LF) to specify a 5.2-inch horizontal width (*horz*) and 2.9-inch vertical height (*vert*) of the box, both horizontal (*h*) and vertical (*v*) edges 2 dot line thickness.

    In the same Form command, specify one vertical line 0.8 inches (*Line1*) from the edge of the form with a 1 dot line thickness (*t*) and another vertical line 3.6 inches (*Line2*) from the previous line also with a 1-dot line thickness (*t*).

Format: (cc)M (cc) T *dis*
(cc)LF *horz vert h v line1 t line2 t*

Enter: ^M^T0150
^LF0520,0290,2,2,0080,1,0360,1

16. Add the horizontal lines to the interior box. Again, an Interrupt (I) command is used to process and print the data 0.4 inches (*dis*) lower than the top border of the interior box. The Standard Alphanumeric command (M) is used to introduce the other commands in the sequence. Use the Horizontal Tab command (T) to tab 1.5 inches from the left margin for the horizontal print position. The solid horizontal lines are generated using the Solid Line (LS) command. Specify a 5.2 inch horizontal (*horz*) length and a 0.0 and 1 dot vertical length (*vert*), used as the line thickness in this case.

Format: (cc)I *dis* (cc)-
(cc)M (cc)T *dis* (cc)LS *horz vert*

Enter: ^I040^-
^M^T0150^LS0520,0001

17. Print five more horizontal lines identical to the one created in the previous step and evenly spaced 0.4 inches apart. Use the same command as in the previous step and repeat it five times. Use an Interrupt command (I) followed by a Graphics Mode carriage return to move the print position 0.8 inches (*dis*) lower.

Enter: ^I040^-
^M^T0150^LS0520,0001
^I040^-
^M^T0150^LS0520,0001
^I040^-
^M^T0150^LS0520,0001
^I040^-
^M^T0150^LS0520,0001
^I040^-
^M^T0150^LS0520,0001
^I080^-

You have completed the text in the upper portion of the form and the lined box for the item, description and price data. Our sample HandCraft Boats form now looks like the one shown in Figure 40.

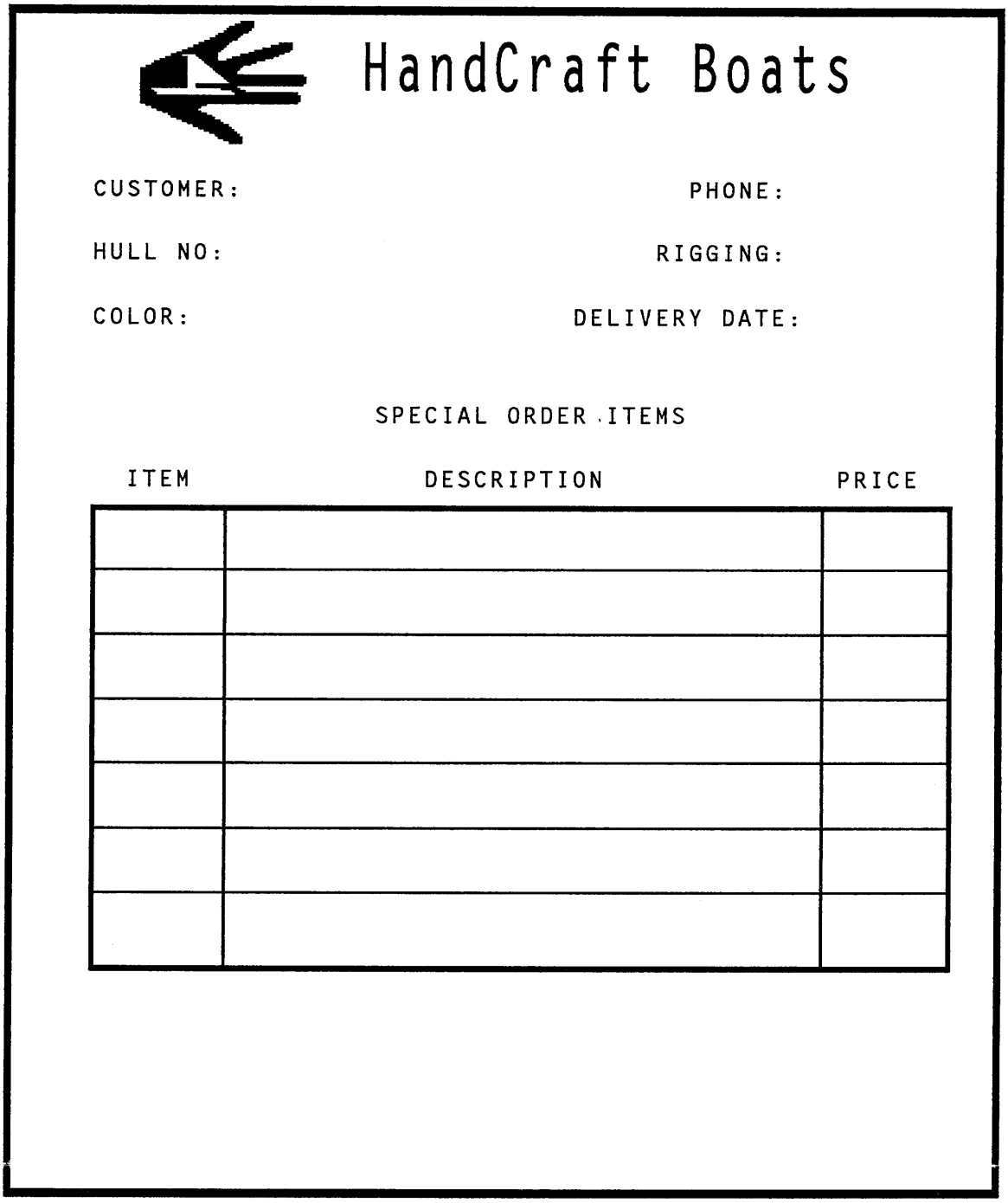


Figure 40. Practice Form Example

Enter the Corners

18. A series of lines can be drawn to create the corners around the slogan at the bottom of the form. A Standard Alphanumeric command (M) is used to introduce the command sequence. A Horizontal Tab command (T) is used to move the print position of the upper left horizontal line of the corner 2.5 inches (*dis*) from the left margin. A Solid Line command (LS) is used to specify the upper left line of the corner as 0.5 inches plus 5 dots horizontal length (*horz*) and 2 dots vertical length (*vert*).

Format: (cc)M (cc)T *dis* (cc)LS *horz vert*

Enter: ^M^T0250^LS0055,0002

19. Use another Horizontal Tab command (T), within the same alphanumeric command sequence, to move the print position 5.1 inches (*dis*) from the left margin for the upper right line of the corner. Use another Solid Line command (LS) to specify the upper right line of the corner as 0.5 inches plus 5 dots horizontal length (*horz*) and 2 dot vertical length (*vert*).

Format: (cc)M (cc)T *dis* (cc)LS *horz vert*

Enter: ^T0510^LS0055,0002

20. The two vertical lines of the corner set are drawn in a similar fashion within the same command sequence. For the left vertical line, the Horizontal Tab (T) command specifies a tab position 2.5 inches (*dis*) from the left margin and the Solid Line (LS) command creates a line 2 dots in horizontal length (*horz*) and 0.8 inches vertical length (*vert*). The right vertical line is positioned by a tab 5.6 inches and 5 dots (*dis*) from the left margin and the line is created 2 dots horizontal length (*horz*) and 0.8 inches vertical length (*vert*).

Format: (cc)T *dis* (cc)LS *horz vert*

Enter: ^T0250^LS0002,0080
^T0565^LS0002,0080

21. The left and right horizontal bottom lines of the corner set are justified 0.8 inches (*jus*) down using a Justification (J) command. Following the justification, a Horizontal Tab (T) moves the print position 2.5 inches (*dis*) from the left margin for the left line created by a Solid Line command (LS) as 0.5 inches plus 5 dots horizontal length (*horz*) and 2 dots vertical length (*vert*). The right bottom line is created 0.5 inches plus 5 dots horizontal length (*horz*) and 2 dots vertical length (*vert*) at a position 5.1 inches from the left margin (*dis*).

Format: (cc)J *jus* (cc)T *dis* (cc)LS *horz vert*
(cc)T *dis* (cc)LS *horz vert*

Enter: ^J080^T0250^LS0055,0002
^T0510^LS0055,0002

22. To generate the HandCraft Boats company address and phone number data on the lower left of the form, justify the text 2 dots (*jus*) down using the Justification (J) command, tab in 1.5 inches (*dis*) from the left margin with the Horizontal Tab (T) command, select the 17.65 cpi font with the Compressed Print (S) command, and supply the HANDCRAFT BOATS company name as the data.

Format: (cc)J *jus* (cc)T *dis* (cc)S *f data*

Enter: ^J002^T0150^S5HANDCRAFT BOATS

23. The street address line is justified 0.2 inches lower (*jus*) using a Justification command (J), positioned 1.5 inches (*dis*) from the left margin with a Horizontal Tab command (T), a 17.65 cpi compressed print command (S5) is sent for each new line of data, and the data is supplied as 123 BOAT WAY.

Format: (cc)J *jus* (cc)T *dis* (cc)S *f data*

Enter: ^J020^T0150^S5123 BOAT WAY

24. Using the same type of Justification command (J) and Horizontal Tab (T) command set, the BOAT TOWN, CA city data is justified 0.3 plus 6 dots (*jus*) down and tabbed 1.5 inches (*dis*); the 333444 zip code data is justified 0.5 plus 5 dots (*jus*) and tabbed 1.9 inches plus 5 dots (*dis*); the (714) 555-0011 phone number data is justified 0.7 plus 3 dots and tabbed 1.5 inches (*dis*). A new 17.65 cpi compressed print command (S5) is required immediately preceding each line of data.

Format: (cc)J *jus* (cc)T *dis* (cc)S *f data*

Enter: ^J036^T0150^S5BOAT TOWN, CA
^J055^T0195^S5333444
^J073^T0150^S5(714)555-0011

Enter the Slogan

25. Add the slogan between the corners previously drawn. A Standard Alphanumeric command (M) is used to specify a character 0.1 inch high (*ht*), 0.1 inch wide (*wd*), and justified 0.4 inches (*jus*). The slogan is tabbed 2.7 inches (*dis*) from the left margin, lowercase descending characters are enabled by the Descending Characters (D) command, the slogan Quality Boats Crafted By Hand is supplied as data.

Format: (cc)M *ht wd jus*
(cc)T *dis* (cc)D *data*

Enter: ^M01,01,040
^T0270^DQuality Boats Crafted By Hand

Enter the Barcode

26. Within the same alphanumeric command, the barcode can be generated. Using the Character Height command (H), the character height is changed to 0.3 inches (*ht*) and using the Justification command (J), the position is moved down 0.5 inches (*jus*). The barcode is positioned 5.9 inches (*dis*) from the left margin by a Horizontal Tab (T) command. The barcode itself is begun by the Horizontal Bar Code command (B), using the standard 10 cpi readable data field (*p*), and barcode Code 39 Type A (*type*) with the default ratio specified. The barcoded data is WC to distinguish the HandCraft Boats company West Coast sales region and the command sequence is terminated.

Format: (cc)H *ht* (cc)J *jus* (cc)T *dis*
(cc)B *p type data* (cc)G

Enter: ^H03^J050^T0590
^BYAWC^G

Disable VGL Graphics

27. To complete the form, enter an Interrupt command (I) moving the print position back to the original position followed by a Graphics Mode carriage return. Disable the Free Format command (O) and disable the Graphics Mode of Operation (PN) also followed by a Graphics Mode carriage return.

Format: (cc)I *dis* (cc)-
(cc)O(cc)-(cc)PN(cc)-

Enter: ^I000^-
^O^-^PN^-

The complete data for the form (the contents of the file for the form on the host computer) appears below. The completed form is shown in Figure 41 on page 327.

```
^PY^-
^F^-
^,
^M^KF
^J110^T0100
^LB0600,0740,3,3
^M^J120^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,
01,03,03,07,0F,1F,1F,3F,3F,7E,7C,78,70^G^M^J130^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,01,01,03,03,07,07,0F,0F,1F,1F,3F,3F,7F,7F,
7F,7E,7C,78,70,60,40,40,00,00,00,00,01,01,03,03,03,07,07,07,0F,0F,0F,1F,1F,1E,
1E,1C^G
^M^J140^T0175^Q
01,01,03,03,07,0F,0F,1F,1F,3F,3F,7F,7F,7F,7F,3F,3F,00,00,00.40,60,70,78,7C,7E,
7F,7F,0F,0F,0F,1F,1F,3F,3F,3F,7E,7C,7C,7C,78,78,70,70,70,60,60,60,40,40^G
^M^J150^T0175^Q
7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,00,00,00,01,01,01,01,01,01,
01,41,61,71,79,7D,7F,7F,7F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,1F,
1F,1F,1F,1F,1F,1F,1F,0E^G
^M^J160^T0175^Q
7F,7F,7F,7F,5F,4F,47,47,47,47,47,47,47,47,47,47,07,07,07,07,47,47,47,47,47,47,47,
47,47,67,67,67,67,77,7F,3F,1F,1F,0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,0F,
```

```
0F,0F,0F,0F,07-G
^M^J170^T0175^Q
40,40,60,60,70,70,78,78,7C,7C,7E,7F,7F,7F,7F,7F,7F,7F,7F,7F,7F,77,63,63,41,41,
40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40,
40,40,40,40^G
^M^J180^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,40,40,60,60,70,70,78,78,7C,7C,7E,7E,7F,7F
,3F,3F,1F,0F,0F,07,03,01^G
^M^J190^T0175^Q
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,
40,60,60,70,70,78,78,78,78,38^G
^M03,02,129^T0310HandCraft Boats^G
^I220^-
^M01,01,000^KF
^T0150CUSTOMER:^T0150PHONE:
^J040
^T0150HULL NO:^T0490RIGGING:
^J080
^T0150COLOR:^T0440DELIVERY DATE:
^J140
^T0320SPECIAL ORDER ITEMS
^J180
^T0170ITEM^T0350DESCRIPTION^T0600PRICE
^I200
^M^T0150^KF
^LF0520,0290,2,2,0080,1,0360,1
^I040
^M^KF^T0150^LS0520,0001
^I040
^M^KF^T0150^LS0520,0001
^I040
^M^KF^T0150^LS0520,0001
^I040
^M^KF^T0150^LS0520,0001
^I040
^M^KF^T0150^LS0520,0001
^I040
^M^KF^T0150^LS0520,0001
^I080
^M^KF^T0250^LS0055,0002
^T0510^LS0055,0002
^T0250^LS0002,0080
^T0565^LS0002,0080
^J080^T0250^LS0055,0002
^T0510^LS0055,0002
^M^J002^T0150^S5HANDCRAFT BOATS
^J020^T0150^S5123 BOAT WAY
^J036^T0150^S5BOAT TOWN, CA
^J055^T0195^S5333444
^J073^T0150^S5 (714) 555-0011
^M01,01,040
^T0270^DQuality Boats Crafted by Hand
^H03^J050^T0590
^BYAWC^G
^I000^-
^O^-^PN^-
```

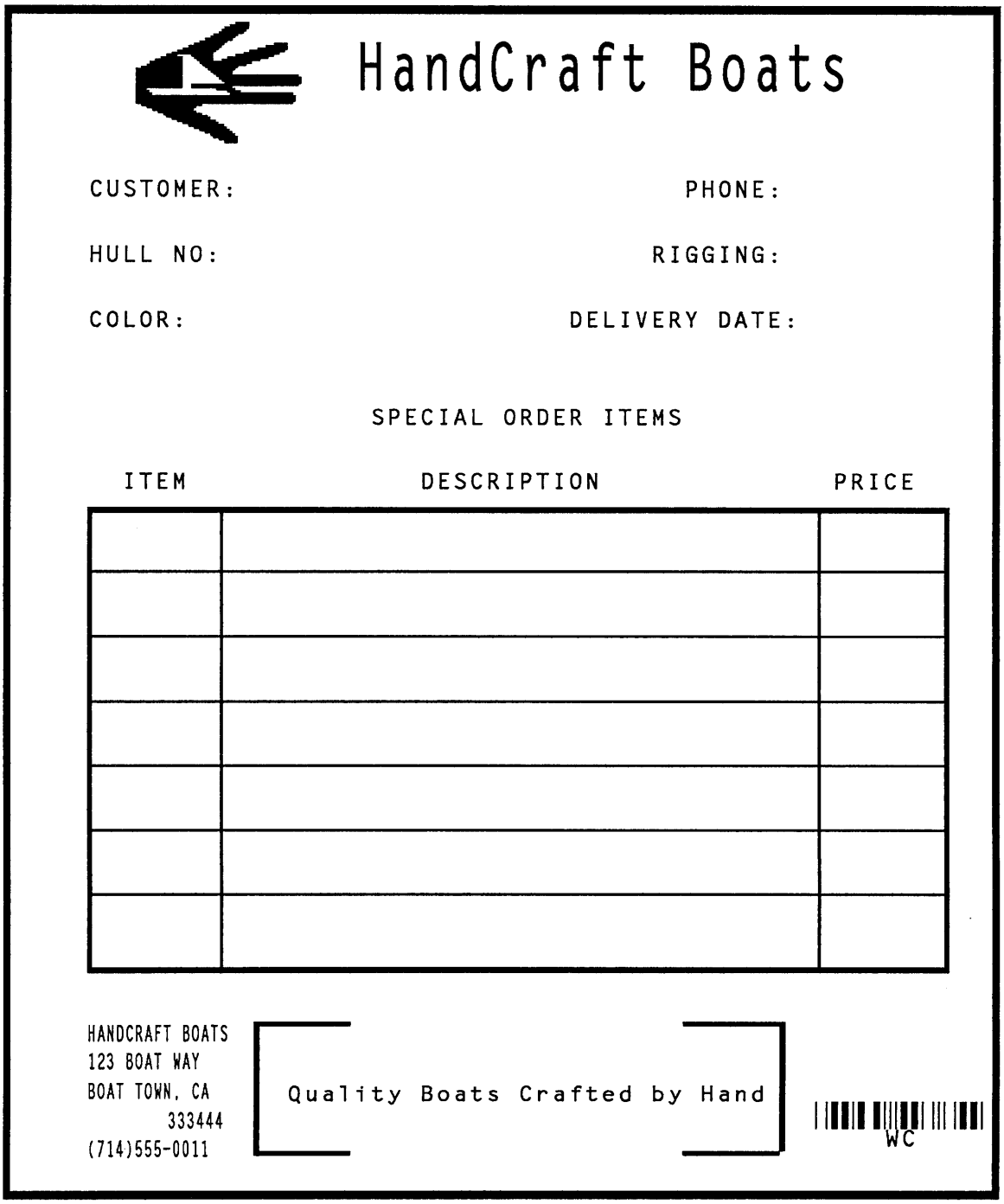


Figure 41. Completed Practice Form Example

Label Example

This practice exercise is designed to provide experience in creating and processing a sample label. The label includes:

- horizontal duplication
- alphanumeric data
- horizontal and vertical lines
- dynamic data fields
- boxes
- barcodes

As in the form example, all data for the labels is entered into a file on the host computer. Use your standard system commands to open the file and print the file as needed. Also, the same Enter/Format explanations are provided in this example. You enter the data listed under **Enter**; the general command format is listed under **Format**. Always use the actual SFCC required by your system wherever the ^ is shown in the examples or where the (cc) is shown in the general format. Do not forget to properly terminate each command line. Make sure the printer power is on and that the printer is ready and on line.

NOTE: Similar to the previous example exercise, your printed output may vary in appearance or location based on your type of printer and printer configuration; these samples have been positioned on the page to correspond with the related text.

The labels for this exercise are shown in Figure 42, complete with all label elements and data. One label is actually created by VGL commands and then duplicated horizontally on the page. When the first set of dynamic data is supplied, it is inserted in the label and in the duplicate. The second set of dynamic data is inserted in a second label and duplicate. This process could be continued to produce any number of labels.

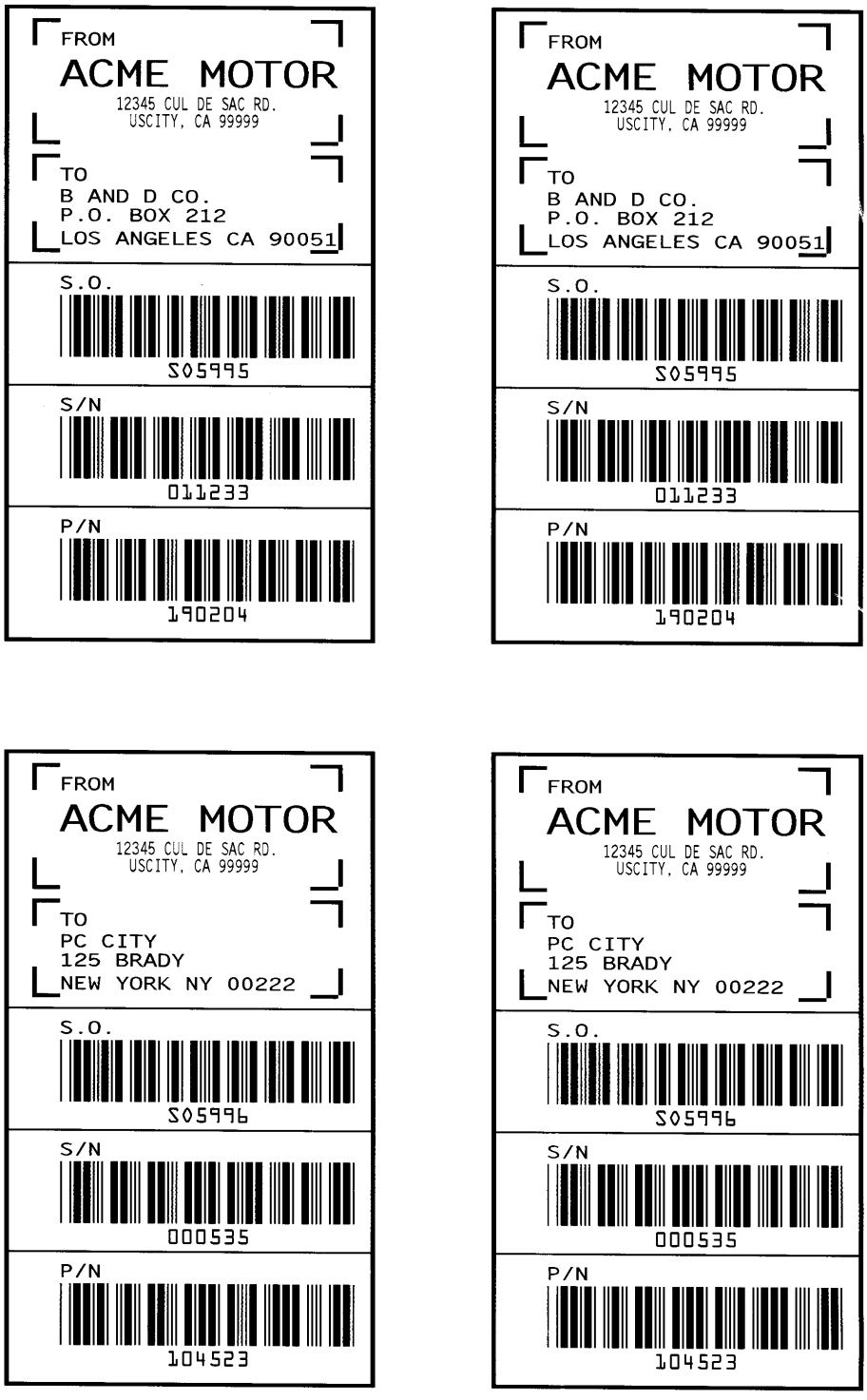


Figure 42. Sample Labels

Enable VGL Graphics

1. Use the Graphics Mode Enable command (PY), to enable VGL for the Graphics Mode.

Format: (cc)PY(cc)-

Enter: ^PY^-

2. To avoid accidentally terminating the graphics command sequence by a host-generated terminator, enable the Free Format command (F). This allows VGL to accept the data as one continuous stream even though the data may contain host-generated paper motion commands. When Free Format is enabled, VGL only recognizes the Free Format command terminators: Carriage Return (^-), Form Feed (^,), Line Feed (^*), Vertical Tab (^+), and EVFU commands.

Format: (cc)F(cc)-

Enter: ^F^-

Enable Dynamic Form Processing

Dynamic form processing allows specific data fields within the form/label to be identified. After all form or label components have been created, different sets of data can be supplied to the fields as copies of the label are produced.

3. To enable dynamic form processing, the Dynamic Form command (B) is used followed by a Graphics Mode carriage return. It is part of the standard graphics command set, and must be sent to VGL without being introduced by an alphanumeric command. Once dynamic form processing is enabled, VGL continues in the Dynamic Form Mode until properly completed.

Format: (cc)B(cc)-

Enter: ^B^-

Enable Horizontal Duplication

One label is created and duplicated on the page horizontally. This produces a duplicate copy of the label when the dynamic data is supplied. All commands required to create the label must fall between Horizontal Duplication on and off commands.

4. Begin with the Horizontal Duplication (S) command to turn horizontal duplication on. Specify 2 copies (#) spaced 4.0 inches apart (*gap*). Send a Graphics Mode carriage return after the Horizontal Duplication command.

Format: (cc)S # *gap* (cc)-

Enter: ^S0240^-

Create the Label Box

5. Use the extended graphics command set to create the label components. The Standard Alphanumeric command (M) is used to introduce the extended graphics command set. Use the Box command (LB) to create the box for the outer border of the label. The box is 2.6 inches plus 4 dots horizontally (*horz*) and 4.7 inches vertically (*vert*). Both the horizontal (*h*) and vertical (*v*) borders of the box have a line thickness of 2 dots.

Format: (cc)M(cc)LB *horz vert h v*

Enter: ^M^LB0264,0470,2,2

Create the Corners

Two sets of corners are used in the label, one corner set around the "From" data and the other set around the "To" data.

6. To create these corners, one vertical and horizontal line are justified and tabbed into proper position for each corner piece, eight lines total (four corner pieces) per corner set. All the commands required for the corner sets are part of the alphanumeric command sequence initiated in the previous step. A Justification command (J), Horizontal Tab command (T), and a Solid Line command (LS) are used for each line.

Format: cc)J *jus* (cc)T *dis* (cc)LS *horz vert*

Enter:
^J010^T0020^LS0020,0002
^J010^T0220^LS0020,0002
^J010^T0020^LS0002,0020
^J010^T0240^LS0002,0020
^J080^T0020^LS0002,0020
^J080^T0240^LS0002,0020
^J100^T0020^LS0020,0002
^J100^T0220^LS0020,0002
^J110^T0020^LS0020,0002
^J110^T0220^LS0020,0002
^J110^T0020^LS0002,0020
^J110^T0240^LS0002,0020
^J160^T0020^LS0002,0020
^J160^T0240^LS0002,0020
^J180^T0020^LS0020,0002
^J180^T0220^LS0020,0002

Add TO/FROM Alphanumeric Data

7. To add the "From" data, use a series of Standard Alphanumeric commands (M) to specify 0.1 inch high (*ht)* by 0.1 inch wide (*wd*) characters justified 0.2 inches (*jus*) down for the FROM heading.

   Use a Horizontal Tab (T) to position the heading 0.4 inches (*dis*) from the margin. In a similar command sequence, specify 0.2 inch high and 0.2 inch wide characters justified 0.4 inches down for the Printronix heading, also tabbed 0.4 inches from the margin.

   Justify the street address data 0.6 inches plus 5 dots (*jus*) down using a Justification command (J) and tab the address data 0.8 inches (*dis*) from the margin using a Horizontal Tab command (T). In a similar Justification and Horizontal Tab sequence, justify the city and state data 0.8 inches down and tabbed 0.9 inches from the margin.

   For the address data, select the 17.65 cpi compressed print font (*f*) using the Compressed Print command (S) in a new Standard Alphanumeric command (M) sequence. (A compressed print command must immediately precede the compressed print data for each line where it is used.)

Format: cc)M *ht wd jus* (cc)T *dis data*
(cc)M(cc)J *jus* (cc)T *dis* (cc)S *f data*

Enter:
```
^M01,01,020^T0040FROM
^M02,02,040^T0040ACME MOTOR
^M^J065^T0080^S512345 CUL DE SAC RD.
^J080^T0090^SUSCITY, CA 99999
```

8. The "To" data includes dynamic data fields for the name, street address, and city data lines of the different companies.

   Begin with a Standard Alphanumeric command (M) to specify the TO heading as 0.1 inch high (*ht*) by 0.1 inch wide (*wd*) characters, justified 0.2 inches down (*jus*) and tabbed 0.4 inches (*dis*) from the left margin using the Horizontal Tab command (T). Using a Justification (J) and Horizontal Tab (T) command sequence, position the company name data line 1.3 inches plus 4 dots (*jus*) down and 0.4 inches (*dis*) from the left margin.

   Use a Dynamic Form Field Length command ([) to specify the maximum length (*length*) of the dynamic data field as 24 characters. Similarly, justify the street address line 1.5 inches down, tabbed 0.4 inches from the left margin, and 24 characters maximum length.

   Justify the city and state data line 1.6 inches plus 5 dots down, tabbed 0.4 inches from the left margin, and 24 characters maximum length.

Format: cc)M *ht wd jus* (cc) T *dis data*
(cc)J *jus* (cc) T *dis* (cc) [*length* (cc)G

Enter:
```
^M01,01,120^T0040TO
^J134^T0040^[024^G
^J150^T0040^[024^G
^J165^T0040^[024^G
```

Add Horizontal Lines

9. The three horizontal lines to separate the three barcode fields can be added to the form using Justification (J), Horizontal Tab (T) and Solid Line (LS) commands. All three lines are 2.6 inches plus 4 dots horizontally (*horz*) and 1 dot vertically (*vert*), used as the line thickness, and all three lines are tabbed 0.0 inches (*dis*) from the left margin (touching the left edge of the label). Justify the first line 1.9 inches down (*jus*), the second line 2.8 inches down, and the third line 3.7 inches down.

Format: (cc)J *jus* (cc)T *dis* (cc)LS *horz vert*

Enter: ^J190^T0000^LS0264,0001
^J280^T0000^LS0264,0001
^J370^T0000^LS0264,0001

Add Headings

10. The Sales Order (S.O.), Serial Number (S/N), and the Part Number (P/N) headings can be added using a series of Justification (J) and Horizontal Tab (T) commands. Each of the headings are tabbed 0.4 inches (*dis*) from the left margin. Justify the S.O. heading 2.0 inches (*jus*) down, the S/N heading 2.9 inches down, and the P/N heading 3.8 inches down.

Format: (cc)J *jus* (cc)T *dis data*

Enter: ^J200^T0040S.O.
^J290^T0040S/N
^J380^T0040P/N

Add Barcodes and Dynamic Bar Code Data

11. The three barcodes and dynamic barcode data fields can now be input. A Standard Alphanumeric command (M) is used to specify each barcode height at 0.6 inches (*ht*) and width (*wd*) at 0.1 inch. (The actual width of the barcode is determined by the type of barcode, the data, and the ratio.)

    The S.O. barcode is justified 2.1 inches plus 3 dots (*jus*) down, the S/N barcode 3.0 inches plus 3 dots down, and the P/N barcode 3.9 inches plus 3 dots down. Each barcode is tabbed 0.4 inches (*dis*) from the left margin using a Horizontal Tab command (T). The horizontal Bar Code command (B) with fixed ratio is used, the printable data field is selected (*p*) to produce human readable data using OCR-B characters with the barcode, and barcode type (*type*) Code 39 is selected for use.

    The Dynamic Form Field Length command ([) specifies a maximum of 6 data characters for each barcode.

Format: (cc)M *ht wd jus* T *dis data*
(cc)B *p type* (cc)[*length* (cc)G

Enter: ^M06,01,213^T0040
^BOA^[006^G
^M06,01,303^T0040
^BOA^[006^G
^M06,01,393^T0040
^BOA^[006^G

12. To complete processing, send an Interrupt command (I) moving the print position to 5.5 inches (*dis*) lower followed by a Graphics Mode carriage return (-), end the Horizontal Duplication command (S), and end the Dynamic Form command (]).

Format: (cc) I (cc)-
(cc) S (cc)-
(cc)]

Enter: ^I550^-
^S^-
^]

Add Dynamic Data

13. The lines of dynamic data can now be sent.

    The first line of data sent is inserted in the first dynamic field previously identified by the Dynamic Form Field Length command. In this case, the first dynamic field identified was the company name data line (page 332). Subsequent dynamic fields identified were the company street address, city, S.O., S/N, and P/N data; the corresponding data should be sent line by line in the proper order to fill the fields.

    Sending a second set of the data generates a second form (with duplication) inserting the data in the fields in the order provided. If any particular data field contains less than the amount specified in the Dynamic Form Field Length command, a Graphics Mode carriage return (-) must also be sent as the last character in the data line. Any data exceeding the maximum amount specified begins to fill subsequent fields.

    Following the end of all data, a universal terminator (G) must be sent. The two sets of data for the labels are entered as follows.

Enter: B AND D CO.^-
P.O. BOX 212^-
LOS ANGELES CA 90051^-
SO5995
011233
190204
PC CITY^-
125 BRADY^-
NEW YORK, NY 00222^-
SO5996
000535
104523^G

Disable Graphics Mode

14. Complete processing by sending a Graphics Mode form feed (,), disabling the Free Format command (O), and disabling the Graphics Mode (PN).

Enter: ^,^O^-^PN^-

The complete program to generate the labels shown in Figure 42 on page 329 is listed below. Use your system standard commands to print the file containing the program. If errors occur, check your input and refer to Chapter 6.

```
^PY^-
^F^-
^B^-
^S0240^-
^M^LB0264,0470,2,2
^J010^T0020^LS0020,0002
^J010^T0220^LS0020,0002
^J010^T0020^LS0002,0020
^J010^T0240^LS0002,0020
^J080^T0020^LS0002,0020
^J080^T0240^LS0002,0020
^J100^T0020^LS0020,0002
^J100^T0220^LS0020,0002
^J110^T0020^LS0020,0002
^J110^T0220^LS0020,0002
^J110^T0020^LS0002,0020
^J110^T0240^LS0002,0020
^J160^T0020^LS0002,0020
^J160^T0240^LS0002,0020
^J180^T0020^LS0020,0002
^J180^T0220^LS0020,0002
^M01,01,020^T0040FROM
^M02,02,040^T0040ACME MOTOR
^M^J065^T0080^S512345 CUL DE SAC RD.
^J080^T0090^S5USCITY, CA 99999
^M01,01,120^T0040TO
^J134^T0040^[024^G
^J150^T0040^[024^G
^J165^T0040^[024^G
^J190^T0000^LS0264,0001
^J280^T0000^LS0264,0001
^J370^T0000^LS0264,0001
^J200^T0040S.O.
^J290^T0040S/N
^J380^T0040P/N
^M06,01,213^T0040
^BOA^[006^G
^M06,01,303^T0040
^BOA^[006^G
^M06,01,393^T0040
^BOA^[006^G
^I550^-
^S^-
```

```
^]
B AND D CO.^-
P.O. BOX 212^-
LOS ANGELES CA 90051^-
SO5995
011233
190204
PC CITY^-
125 BRADY^-
NEW YORK, NY 00222^-
SO5996
000535
104523^G
^,^O^-^PN^-
```

Solving Program Errors

If you make an error in your form program, a coded error message and the program line containing the error prints when you print the form. As soon as VGL discovers and identifies the error, the form is printed up to the point of error, further text processing stops, and all remaining data up to the next command sequence terminator is ignored.

From the description of the error message and the line identified by the error message, you can easily locate and correct program errors. Coded error messages are defined in detail in Chapter 6.

5 *Multinational And International Character Sets*

Multinational Character Sets

The Multinational Character Set accesses one of 32 international character sets. Each character set is 96 characters long and can be accessed by configuration selection or VGL command. Individual characters in the font can be accessed with the use of data bit 8.

The Multinational Character Set provides VGL with space for 32 character sets, 96 characters each. The character sets and their corresponding set values are listed in Table 70.

Table 70. Multinational Character Sets and Set Values

Character Set	Value	Character Set	Value
U. S. ASCII	0	Spanish	9
German	1	Italian	10
Swedish	2	Turkish	11
Danish	3	CP 437	12
Norwegian	4	CP 850	13
Finnish	5	Reserved	14-15
English	6	Dwn Overlay	16-23
Dutch	7	User-Defined-Sets	24-31
French	8		

Sets 0 through 11 are resident character sets. Sets 12 through 23 are reserved spaces in font memory for future resident character sets. If a value from 12 through 23 is called when attempting to choose a character set, the character font defaults to ASCII. The last eight addressable character set values, 24 through 31, are reserved for user-defined sets. You can create custom character sets from existing characters in font memory. If you select a set value from 24 through 31 when no new character set has been created or assigned that value, the character font defaults to ASCII.

See page 349 for printouts of the primary and extended character sets and their corresponding values.

To select one of the Multinational Character Sets, use the character set selection command described on page 345.

Character Addresses

Both the ASCII and multinational character sets have hex values for each character and symbol. The primary character set (ASCII characters) resides at hex addresses ranging from 00 through 7F. The extended character set, which contains the multinational characters, resides at hex addresses ranging from 80 through FF. Table 72 shows each multinational character substitution hex value and the applicable ASCII hex values. To access the extended character set, VGL must be configured with the data bit 8 option enabled.

Making Character Substitutions

Multinational character sets are created by substituting the multinational character values for the standard ASCII values. Each of the 12 multinational character sets allows up to 16 character substitutions (located at hex 21, 22, 23, 24, 25, 26, 40, 5B, 5C, 5D, 5E, 60, 7B, 7C, 7D, and 7E). The most common character substitutions specific to a particular country are provided in each set and shown in Table 72.

For example, when the Danish character set (page 350) is selected, calling character address cell 5B substitutes the Danish character residing at C6 (Æ) from the Multinational Character Set (page 349); when the Spanish character set (page 351) is selected, calling character address cell 7C substitutes the Spanish character residing at F1 (ñ) from the Multinational Character Set.These substitutions are automatically performed when a particular Multinational Character Set is selected.

Table 71. Multinational Character Sets and Set Values, Line Matrix Printers

	0XX Standard	1XX Arabic	2XX Cyrillic	3XX European	4XX Greek	5XX Hebrew	6XX Turkish	7XX Misc.
00	US ASCII	ASMO 449	Cyrillic 866	Latin 2 8859-2	DEC 256 Greek	Hebrew Old	Data Gen. Turk	Block-Set 10cpi
01	German	ASMO 449+	Cyrillic CP 437	Latin 2 852	ELOT 928 Greek	Hebrew New	DEC Turkish	Italics Set
02	Swedish	ASMO 708	Cyrillic 113	Mazovia	Greek 3	Hebrew DEC	IBM Turkish	Scanblock 10cpi
03	Danish	ASMO 708+	Cyrillic 8859-5	Kamenicky	ABY Greek	Latin-1 Hebrew	Siemens Turkish	PGL Thai Sets
04	Norwegian	MS DOS CP710	ISO 915	Roman 8	ABG Greek	Win. CP 1255	PTT Turkish	
05	Finnish	MS DOS CP720	Code Page 855	PC-437 Slavic	ELOT 927 Greek		IBC Turkish	
06	English	Sakr CP714	7-bit Cyrillic	Slavic 1250	Greek 851		Bull Turkish	
07	Dutch	Aptec CP715	Ukrainian	Code Page 865	Greek 437		AS400 Turkish	
08	French	CP 786	Bulgarian	Code Page 860	Greek 8859-7		Unisys Turkish	
09	Spanish	Arabic CP 864	Win. CP 1251	Latin 1 8859-1	Win. CP 1253		NCR Turkish	
10	Italian	Arabic CP 1046		Latin 5 8859-9	Greek 813 Euro		PST Turkish	
11	Turkish	Arabic Lam 1		Latin 9 8859-15	Greek 869 Euro		Unis-1 Turkish	
12	CP 437	Arabic Lam 2		Polish POL1			Code Page 853	
13	CP 850	Win. CP 1256		Win. CP 1250			Info Turkish	
14		Farsi 1		Win. CP 1252			Win. CP 1254	
15		Farsi 2		Win. CP 1257			Code Page 857	
16		1098 Farsi 1285		CP 858 Euro				
17				Lith. CP 773				

Table 71. Multinational Character Sets and Set Values, Line Matrix Printers (continued)

	0XX Standard	1XX Arabic	2XX Cyrillic	3XX European	4XX Greek	5XX Hebrew	6XX Turkish	7XX Misc.
18				Serbo Croatic 1				
19				Serbo Croatic 2				
20				CP 774				
21				CP 775				
22				ISO 8859-4				
23	Reserved							
24-31	User Defined Sets							

Table 72. Substitution Set Hex Values

Character Set	Substitution Hex Value															
U.S. ASCII	21	22	23	24	25	26	40	5B	5C	5D	5E	60	7B	7C	7D	7E
Danish								C6	D8	C5		B0	E6	F8	E5	
Dutch			A3						80					81		
English			A3													
Finnish				A4				C4	D6	C5			E4	F6	E5	FC
French							E0	FB	E7	A7	F4	EA	E9	F9	E8	EE
German							A7	C4	D6	DC			E4	F6	FC	DF
Italian							A7	B0	E9	83		F9	E0	F2	E8	EC
Norwegian				A4			C9	C6	D8	C5	DC	E9	E6	F8	E5	FC
Spanish			82					C3	D1	D5	A1		E3	F1	F5	BF
Swedish				A4			C9	C4	D6	C5	DC	E9	E4	F6	E5	FC
Turkish	84	C7	E7	85				86	D6	DC	87	88	89	F6	FC	8A

Accessing Characters and Character Sets

Data Bit 8

You can access individual characters using data bit 8 addressing. The primary character set is ASCII. These character values reside at hex addresses 20 through 7F. The Multinational or extended character sets reside at hex addresses 80 through FF and are accessible without reconfiguration.

NOTE: Data bit 8 must be set high so that Multinational or extended character sets are accessible without reconfiguration.

Power-Up Character Set Selection

You can select any one of the twelve resident multinational character sets shown in Table 70 (0 through 11) or any of the International Sets shown in Table 75 as the default character set at printer power-up. VGL configuration settings determine which character set is the default character set at power-up. Refer to your user's manual to configure VGL for a specific character set. (See Select Font in the configuration menu.)

OCR and user-definable character sets cannot be configured as the default character set at printer power-up.

NOTE: Each Multinational Character Set, including the power-up default, must be accessed through the Graphics Mode.

Building a Character Translation Table

The character set for resident fonts on the Graphics Controller contains special characters in hex values. These characters are not directly accessible from the keyboard. As an example, the tilde (~) may not have a corresponding key on the keyboard. There are three choices available if characters such as this are required on a regular basis.

- Select an ISO character set that contains the character as one of the substitutions. See “Selecting an ISO Character Set” on page 348.
- Use the ^IHEX command to transmit the character hex value to the printer.
- Build a character translation table.

A character translation table reassigns keys to the hex value of special characters you want to print. Use the ^ITRANS command to build a character translation table.

Mode Standard Graphics or Graphics with an Extended Graphics Command selected

Format (cc) ITRANS,D,xxvv,xxvv,xxvv,xxvv, ... ,xxvv (cc) G (cc) -

(cc) Represents the Special Function Control Character (SFCC). Enter the specific SFCC for your VGL configuration.

ITRANS,D	The Build Character Translation Table command; enter **ITRANS,D** (the comma is required).
xx	The input hex value from the host.
vv	The hex value that will replace the input hex value before the data is sent to the printer.
(cc)G	Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command to end the input of vertical line and form data.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your IGP configuration immediately followed by - to end the command sequence.

Resetting the Character Set

Purpose Reset the character set. This will also clear the translation table

Mode Graphics

Format (cc) ITRANS,R,*nn* (cc) G (cc) -

(cc)	Represents the Special Function Control Character (SFCC). Enter the specific SFCC for your VGL configuration.
ITRANS,D	The Character Set Reset command; enter **ITRANS,R** (the comma is required).
nn	The identification of the new character set
(cc)G	Terminator. Enter the SFCC for your VGL configuration immediately followed by **G**, the universal terminator, or another valid Graphics Mode command to end the input of vertical line and form data.
(cc)-	Graphics Mode CR used as a sequence terminator. Enter the SFCC for your IGP configuration immediately followed by **-** to end the command sequence.

If the character set identified by *nn* is not the current character set, the translation table is reset and the selected *nn* character set becomes the current character set.

nn	**Character Set**
00	USA
01	UK
02	Sweden/Finland
03	Norway/Denmark
04	Japan
05	Germany
06	France
07	Italy

08	Spain
09	PC Subset
10	VGL Version 1

User-Defined Set Command

Purpose Creates custom character sets (except OCR fonts) from existing characters stored on the flash memory.

Mode Graphics

Format (cc) u *n ca fa* (cc)-

(cc)	Represents the Special Function Control Code (SFCC). Enter the specific SFCC for your VGL configuration.
u	The User Set command; enter **u**.
n	Selects the User Character Set number; enter a value ranging from **1** through **8**. Values outside this range produce an error message and the entire command sequence is ignored.
ca	Represents the ASCII character address cell which has its contents replaced with the character located in the font address (*fa*). The *ca* value must be one of the 16 hex values specified in Table 72. If the *ca* value is not one of these ASCII characters, an error message is displayed, the command sequence is ignored, and only previous valid substitutions are made.
fa	Represents the hexadecimal value for the font address of a specified character in the multinational character set which replaces the current contents of *ca*. The *fa* value is the character substitution for the cell address (*ca*). The value of *fa* may range from hex **20** through **FF**. If the *fa* value is outside this range, an error message is displayed and no substitutions occur.
(cc)-	The command terminator. Enter the SFCC for your VGL configuration immediately followed by **-** (Graphics Mode CR) or other valid terminator. The terminator must be entered to stop this function.

Comment The User Set command is a stand-alone command that must appear in the first column of a line. You can define up to 16 character substitutions for each of the eight custom character sets, but they need not be addressed all at one time with one User Set command. Therefore, the maximum number of times *ca,fa* can be called within each User Set command is 16.

The character sets in the User Set command are numbered 1 through 8. The character set values in the Character Set Selection command are numbered 24 through 31 and correspond to the User Sets 1 through 8. The Character Set Selection command, discussed on page 345, accesses a character set and activates it for printing.

The User Set command **(cc)u*n*** and the Character Set Selection command **(cc)i*n*** are related as shown below. Therefore, i24 selects the substitution set defined as u1, i29 selects u6, etc.

User Set (u*n*)	*corresponds to*	**Character Set (i*n*)**
n = 1		*n* = 24
n = 2		*n* = 25
n = 3		*n* = 26
n = 4		*n* = 27
n = 5		*n* = 28
n = 6		*n* = 29
n = 7		*n* = 30
n = 8		*n* = 31

Example The following example defines User Set 1 to contain the Multinational font addresses B1, A1, and BF at the hex character addresses 23, 24, and 25, respectively.

For example, suppose *ca* = 23 and *fa* = B1; therefore, each time character address 23 is called, it is substituted with the character located at font address B1. Further, when *ca* = 24 and *fa* = A1, each time character address 24 is called, it is substituted with the character located at font address A1. And, when *ca* = 25 and *fa* = BF, each time character address 25 is called, it is substituted with the character located at font address BF.

NOTE: The command sequence contains no spaces.

```
^u1,23B1,24A1,25BF^-
```

User Set 1 now contains the plus or minus sign (hex B1) in place of the number sign (hex 23), the upside down exclamation point (hex A1) in place of the dollar sign (hex 24), and the upside down question mark (hex BF) in place of the percent sign (hex 25).

Character Set Selection Command

Purpose Accesses one of the multinational (Table 70) or international (Table 75) character sets. Use this command to access a different character set from the configured power-up default character set.

Mode Graphics

Format As a stand-alone command: (cc) i *n* (cc)-

Within a graphics command: (cc) i *n* M *ht wd jus data* (cc)-

(cc) Represents the Special Function Control Code.

i The Character Set Selection command; enter **i**.

n The character substitution set number; enter a value from the multinational (Table 70) or international (Table 75) character set tables. Character sets 0 through 23 represent resident character sets. Values from 24 through 31 correspond to the customized user-defined character sets 1 through 8, respectively. Character sets 32 and above represent the International Character sets listed in Table 75.

M *ht wd jus data*
See Chapter 2 for a description of these alphanumeric command parameters.

(cc)- The command terminator. Enter the SFCC for your VGL configuration immediately followed by **-** (Graphics Mode CR) or other valid terminator. The terminator must be entered to stop this function.

Comment The stand-alone command must appear in the first column of a line.

Example The following example shows the Character Set Selection command as a stand-alone command which activates the German character set: ^i1^-

Issue the Character Set Selection command as many times as required for a form. The character set selected remains active until a new set is selected.

The (cc) i *n* (cc)- command is inactive in the Normal Mode. However, plotted text data prints (in a compressed print mode) in the character set selected.

Table 73. Alternate Character Sets

Character Set Name	IF (Intelligent)	TT (TrueType)
Windows Symbol	AS	
ATMType1	AT	
ITC Zapf Dingbats/100	D1	
ITC Zapf Dingbats/200	D2	
ITC Zapf Dingbats/300	D3	
ISO 60: Danish/Norweigan	DN	DN
PS ITC Zapf Dingbats	DS	
DeskTop	DT	DT
ISO 8859/1 Latin 1 (EC94)	E1	E1
ISO 8859/2 Latin 2	E2	E2
ISO 8859/9 Latin 5	E5	E5
ISO 8859/10 Latin 6	E6	E6
ISO 69: French	FR	FR
ISO 21: German	GR	GR
ISO 15: Italian	IT	IT
Wingdings	L$	WD
Legal	LG	LG
Math–8	M8	M8
Macintosh	MC	MC
PS Math	MS	MS
Microsoft Publishing	PB	PB
PC–8, Code Page 437	PC	PC
PC–8 D/N, Code Page 437N	PD	PD
PC–852 Latin 2	PE	PE
Pi Font	PI	PI
PC–850 Multilingual	PM	PM
PC–8 TK, Code Page 437T	PT	PT
PC–775 Baltic	PV	PV

Table 73. Alternate Character Sets

Character Set Name	IF (Intelligent)	TT (TrueType)
Non-UGL, Generic Pi Font		PY
Roman–8	R8	R8
ISO 17: Spanish	SP	SP
ISO 11: Swedish	SW	SW
Symbol		SY
PS Text	TS	TS
ISO 4: United Kingdom	UK	UK
ISO 6: ASCII	US	US
Ventura International	VI	VI
Ventura Math	VM	VM
Ventura US	VU	VU
Ventura 3.1 Latin 1	W1	W1
AgfaTidbits	WD	
Windows 3.1 Latin 2	WE	WE
Windows 3.0 Latin 1	WO	WO
Windows 3.1 Latin 5	WT	WT

Selecting an ISO Character Set

Purpose Accesses one of nine ISO character sets.

Mode Standard Graphics or Graphics with an Extended Graphics Command selected

Format (cc) IISO, *n* (cc)G

(cc) Represents the Special Function Control Code.

IISO, The ISO Character Set Selection command; enter **IISO,** (the comma is required).

n The character substitution set number; enter a value ranging from **0** through **8** according to the desired character set shown in Table 74. If *n* is not a value from 0 through 8, an error message is displayed and the command is ignored.

Table 74. IISO, Character Sets

		Hex Value:											
n	**ISO Character Set**	**23**	**24**	**40**	**5B**	**5C**	**5D**	**5E**	**60**	**7B**	**7C**	**7D**	**7E**
0	USA	#	$	@	[	\	]	^	`	{	|	}	~
1	UK	£	$	@	[	\	]	^	`	{	|	}	-
2	Swedish/Finnish	#	$	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
3	Norwegian/Danish	#	$	@	Æ	Ø	Å	Ü	`	æ	ø	å	ü
4	Japanese	#	$	@	[	¥	]	^	`	{	|	}	-
5	German	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
6	French	£	$	á	5	ç	§	^	`	é	ù	è	¨
7	Italian	£	$	§	5	ç	é	^	ù	à	ò	è	ì
8	Spanish	£	$	§	¡	Ñ	¿	^	`	5	ñ	ç	~

(cc)G The universal terminator. Enter the SFCC for your VGL configuration immediately followed by **G** to terminate the IISO, command.

Comments

When the IISO, command is used in a Standard Graphics command, the printer font set is changed to the new ISO character set. When the IISO, command is used with an Extended Graphics command selected, only the Extended character set is changed to the new ISO character set.

Multinational Character Set Charts

VGL MULTINATIONAL Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	‘	p	IJ			°	À	Đ	à	ð
1			!	1	A	Q	a	q	ij		¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	Ŧ		¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s	|		£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	Ł		¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	Ğ		¦	¶	Æ	Ö	æ	ö
7			’	7	G	W	g	w	ğ		§	·	Ç	×	ç	÷
8			(	8	H	X	h	x	Ş		¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ş		©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	Ĭ		ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{	¨		«	»	Ë	Û	ë	û
C			,	<	L	\	l	|		¬	¼	Ì	Ü	ì	ü
D			–	=	M	]	m	}			ÿ	½	Í	Ý	í	ý
E			.	>	N	^	n	~			®	¾	Î	Þ	î	þ
F			/	?	O	_	o				¯	¿	Ï	ß	ï	

ASCII Set

	0	1	2	3	4	5	6	7
0				0	@	P	‘	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			’	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	[	k	{
C			,	<	L	\	l	|
D			–	=	M	]	m	}
E			.	>	N	^	n	~
F			/	?	O	_	o	

GERMAN Set

	0	1	2	3	4	5	6	7
0				0	§	P	‘	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			’	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	Ä	k	ä
C			,	<	L	Ö	l	ö
D			–	=	M	Ü	m	ü
E			.	>	N	^	n	ß
F			/	?	O	_	o	

SWEDISH Set

	0	1	2	3	4	5	6	7
0				0	É	P	é	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			¤	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	Ä	k	ä
C			,	<	L	Ö	l	ö
D			-	=	M	Å	m	å
E			.	>	N	Ü	n	ü
F			/	?	O	_	o	

DANISH Set

	0	1	2	3	4	5	6	7
0				0	@	P	°	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	Æ	k	æ
C			,	<	L	Ø	l	ø
D			-	=	M	Å	m	å
E			.	>	N	^	n	~
F			/	?	O	_	o	

NORWEGIAN Set

	0	1	2	3	4	5	6	7
0				0	É	P	é	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			¤	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	Æ	k	æ
C			,	<	L	Ø	l	ø
D			-	=	M	Å	m	å
E			.	>	N	Ü	n	ü
F			/	?	O	_	o	

FINNISH Set

	0	1	2	3	4	5	6	7
0				0	@	P	'	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			¤	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	Ä	k	ä
C			,	<	L	Ö	l	ö
D			-	=	M	Å	m	å
E			.	>	N	^	n	ü
F			/	?	O	_	o	

ENGLISH Set

	0	1	2	3	4	5	6	7
0				0	@	P	‘	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			£	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			’	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	[	k	{
C			,	<	L	\	l	|
D			–	=	M	]	m	}
E			.	>	N	^	n	~
F			/	?	O	_	o	

DUTCH Set

	0	1	2	3	4	5	6	7
0				0	@	P	‘	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			£	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			’	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	[	k	{
C			,	<	L	IJ	l	ij
D			–	=	M	]	m	}
E			.	>	N	^	n	~
F			/	?	O	_	o	

FRENCH Set

	0	1	2	3	4	5	6	7
0				0	à	P	ê	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			’	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	û	k	é
C			,	<	L	ç	l	ù
D			–	=	M	§	m	è
E			.	>	N	ô	n	î
F			/	?	O	_	o	

SPANISH Set

	0	1	2	3	4	5	6	7
0				0	@	P	‘	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			₧	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			’	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	Ã	k	ã
C			,	<	L	Ñ	l	ñ
D			–	=	M	Õ	m	õ
E			.	>	N	¡	n	¿
F			/	?	O	_	o	

ITALIAN Set

	0	1	2	3	4	5	6	7
0				0	§	P	ù	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	°	k	à
C			,	<	L	é	l	ò
D			−	=	M	¦	m	è
E			.	>	N	^	n	ì
F			/	?	O	_	o	

TURKISH Set

	0	1	2	3	4	5	6	7
0				0	@	P	Ş	p
1			₶	1	A	Q	a	q
2			Ç	2	B	R	b	r
3			ç	3	C	S	c	s
4			ı	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	Ğ	k	ş
C			,	<	L	Ö	l	ö
D			−	=	M	Ü	m	ü
E			.	>	N	ğ	n	Ĭ
F			/	?	O	_	o	

OCR-A Set

	0	1	2	3	4	5	6	7
0				0	@	P	⊣	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	[	k	{
C			,	<	L	\	l	|
D			-	=	M	]	m	}
E			.	>	N	^	n	~
F			/	?	O	_	o	.

OCR-B Set

	0	1	2	3	4	5	6	7
0				0	@	P	'	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	[	k	{
C			,	<	L	\	l	|
D			-	=	M	]	m	}
E			.	>	N	^	n	~
F			/	?	O	_	o	

International Character Sets

The International Character Sets supported are listed in Table 75. Select these sets from the configuration menu “Select Font” option, or through the character set selection command described on page 345.

See Table 70 for a list of the Multinational Character Sets and their corresponding set values.

Table 75. International Character Sets and Symbol Set Selection Values

Character Set	Set Value	Character Set	Set Value
Arabic	32	**Greek Sets**	
Greek	33	DEC 256 Greek	400
Hebrew	34	ELOT 928 Greek	401
Portuguese	35	Greek 3	402
Spanish	36	ABY Greek	403
Latin 1	37	ABG Greek	404
Slavic 852 (Latin 2)	38	ELOT 927 Greek	405
Farsi	39	Greek 851	406
Turkish	40	Greek 437	407
OCR-A	41	Greek 8859-7	408
OCR-B	42	Win CP 1253	409
Arabic Sets		**Turkish Sets**	
ASMO 449	100	Data General Turkish	600
ASMO 449+	101	DEC Turkish	601
ASMO 708	102	IBM Turkish	602
ASMO 708	103	Siemens Turkish	603
MS DOS CP 710	104	PTT Turkish	604
MS DOS CP 720	105	IBC Turkish	605
Sakr CP 714	106	Bull Turkish	606
Aptec CP 715	107	AS400 Turkish	607
CP 786	108	Unisys Turkish	608
Arabic CP 864	109	NCR Turkish	609
Arabic CP 1046	110	PST Turkish	610
Arabic Lam 1	111	Unis-1 Turkish	611
Arabic Lam 2	112	Code Page 853	612
Win CP 1256	113	INFO Turkish	613
		Win CP 1254	614
		Code Page 857	615

Table 75. International Character Sets and Symbol Set Selection Values

Character Set	Set Value	Character Set	Set Value
Cyrillic Sets		**Hebrew Sets**	
Code Page 866	200	Hebrew Old	500
Cyrillic CP 437	201	Hebrew New	501
Cyrillic 113	202	Hebrew DEC	502
Cyrillic 8859-5	203	Latin-1 Hebrew	503
ISO 915	204	Win CP 1255	504
Code Page 855	205		
7-bit Cyrillic	206		
Ukranian	207		
Bulgarian	208		
Win CP 1251	209		
European Sets			
Latin 2 8859-2	300		
Latin 2 852	301		
Mazovia	302		
Kamenicky	303		
Roman 8	304		
PC-437 Slavic	305		
Slavic 1250	306		
Code Page 865	307		
Code Page 860	308		
Latin 1 8859-1	309		
Latin 5 8859-9	310		
Latin 9 8859-15	311		
Polish Pol 1	312		
Win CP 1250	313		
Win CP 1252	314		
Win CP 1257	315		

6 *Error Codes*

The Purpose of Error Codes

VGL provides coded error messages to help debug programs. When VGL detects an error, it stops text processing and prints out an error message. The error message includes the appropriate error code, a brief description of the error, and the erroneous data. All data up to the next command sequence terminator is ignored, and the form (if any) is printed up to the point of the error.

By VGL configuration, you can disable the printing of all error messages, you can disable printing of off-page errors, or you can enable printing of error location markers. Refer to your *User's Manual* for more information.

Starting below, each error code is listed in numerical order and described in more detail.

Error Codes

01 **Alpha Command Error**
One of the alphanumeric commands has a non-numeric height or width parameter.

02 **Alpha Length Error**
Alpha data has exceeded the length of the internal alpha text buffer. The terminator of the data was not found.

03 Not defined.

04 **Box Command Error**
A Box command (LB) has non-numeric parameter(s).

05 **Buffer Overflow Error**
The internal sequence buffer has overflowed. No sequence terminator found.

06 **Compressed Print Error**
A Compressed Print command (#*x*) has a non-numeric value for the selected compressed print font, or the line terminator is missing.

07 **Special Font Error**
A High Density Look-Up Font (S) command has an invalid value for the font selected. Valid values for *f* are **1** through **9**, inclusive.

08 Not defined.

09 **Form Memory Error**
The form is too big and ran out of form memory during alpha or vector buffer storage.

10 **Character Height Command Error**
A Character Height command (H) has a non-numeric character for the height parameter.

11 **Hex Data Error**
An invalid character was found while expecting a hexadecimal value. Only numeric characters or **A**, **B**, **C**, **D**, **E**, or **F** are allowed.

12 **Vertical Justification Change Error**
A Vertical Justification (J) command has a non-numeric character for the justification parameter.

13 **Form Command Error**
A forms construction command (LF) has a non-numeric parameter.

14 **Undefined Line Command Error**
The Line command (L) was not followed by **B**, **D**, **F**, or **S**.

15 **Logo Command Error**
A user-defined logo using the Z command contains an invalid parameter value; valid values are **1** through **9** or **A** through **F**.

16 **Plot Command Error**
A Plot command (Q or C) contains invalid hexadecimal data characters. Only numeric characters or **A**, **B**, **C**, **D**, **E**, or **F** are allowed.

17 Not defined.

18 **Vertical Duplication (Repeated Form) Terminator Missing Error**
A Vertical Duplication commands (R) does not have a line terminator.

19 **Horizontal Duplication Command Error**
A Horizontal Duplication command (S) contains a non-numeric character or gap space parameter or is not followed by a line terminator.

20 **Horizontal Tab Command Error**
A Horizontal Tab command (T) contains a non-numeric distance parameter.

21 **Special Function Control Code Change Command Error**
A Special Function Control Code (SFCC) change command (N) contains an illegal value for *x* or is not followed by a line terminator. *x* can be any character from hex 11 through hex FF (decimal 17 through 255).

22 **Undefined Command Error**
An SFCC is not followed by a known command character.

In Non-Graphics Mode, the following characters are allowed: #, **B**,**C**, **D**, **E**, **H**, **I**, **K**, **L**, **M**, **N**, **Q**, **R**, **S**, **T**, **U**, **V**, **W**, or @.
Within a repeated form, the following characters are allowed: #, **D**, **E**, **H**, **I**, **K**, **L**, **M**, **N**, **Q**, **R**, **S**, **T**, **U**, **W**, **Z**, or **-**.
In Graphics Mode, the following characters are allowed: **B**, **C**, **D**, **E**, **G**, **H**, **I**, **J**, **K**, **L**, **M**, **Q**, **R**, **S**, **T**, **U**, **V**, **W**, **Z**, or **-**.

23 **Character Width Command Error**
A Character Width command (W) contains a non-numeric width parameter.

24 **Serial Overflow Error**
The serial input buffer is full. The host probably did not honor VGL flow control to stop sending characters.

25 **Line Parameter Error**
A Line command (LS or LD) contains a non-numeric horizontal or vertical length parameter.

26 **Undefined Shading, Mask, or Dark Command Error**
A shading (K) command (shading, shading mask, or dark print) is followed by an unknown character. It must be followed by an **H** for standard shading, an **L** for shading mask, or an **F** for dark printing.

27 **Shading Mask Factor Error**
A Shading Mask command (KL) does not include a valid hexadecimal mask parameter. Only numeric characters or **A**, **B**, **C**, **D**, **E**, or **F** are allowed.

28 **Vertical Duplication (Repeated Form) Parameter Error**
A Vertical Duplication command (R) contains a non-numeric repeat parameter or is not followed by a line terminator.

29 **Inner Vertical Duplication (Repeated Form) Error**
An inner (nested) Vertical Duplication command (R) contains a non-numeric repeat parameter, is not followed by a line terminator, or an inner loop already exists. Only one inner repeat loop is allowed within a repeated form.

30 **Plot Length Error**
A Plot command (Q or C) exceeded the internal plot buffer size. No terminator was found.

31 **Auto Increment/Decrement Command Error**
An Auto Increment/Decrement command (Y) has one of the following faults:

- An invalid value was provided for the +/- parameter. Only **+** or **-** is allowed.
- The increment/decrement amount is zero.
- The command is not followed by (cc)G.
- The increment/decrement has more characters than the operand.

32 **Dot Slew Command Error**
A Dot Slew command (D) contains a non-numeric dots parameter.

33 **Line Slew Command Error**
A Line Slew command (K or W) contains a non-numeric lines parameter.

34 **Forms Length PI Error**
A Forms Length command (L) must use the PI line, but VGL is configured with PI disabled. Use the **H** Forms Length command.

35 **Forms Length No PI Error**
A Form Length command (H) cannot use the PI line, but VGL is configured with PI enabled. Use the **L** Forms Length command.

36 **Dynamic Form Copy Command Error**
A Dynamic Form Copy command (C) contains a non-numeric parameter.

37 **Dynamic Form Field Length Command Error**
A Dynamic Form Field Length command ([*length* or { *length*) contains a non-numeric length parameter.

38 **Dynamic Form Nested Copy Error**
A Dynamic Form Copy command (C) was encountered while already within a copy loop. Copy commands cannot be nested.

39 **Dynamic Data Repeat Count Error**
A repeated dynamic form data element does not have a valid repeat count. The repeat count must be four numeric characters.

40 **Incomplete BarCode Error**
An unexpected end of a barcode command was detected. No barcode type was found, or not enough variable ratio characters were given.

41 **Undefined BarCode Type Error**
An undefined barcode type was given.

43 **BarCode Data Length Error**
The length of the barcode data is too long or too short for the barcode type selected.

44 **Illegal BarCode Data Error**
The barcode data contains a character which is not allowed by this barcode type.

45 **BarCode Off Page Error**
The barcode does not fit on the page at the starting column.

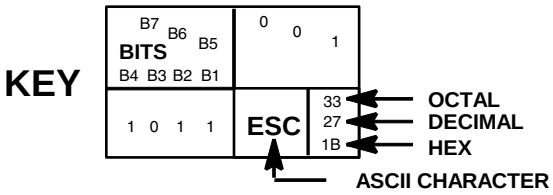
47 **LPI Parameter Error**
The new lpi parameter in the Line Spacing command (@L) contains a non-numeric or 0 value.

48 **Element Off Page Error**
The form element cannot fit on the page at the starting position.

49 Not defined.

50	**User-Defined Logo Input Error** The input parameter is not within the specified range. You must provide either a number ranging from **0** through **9**, or a character from **A** through **F**.
51	Not defined.
52	**Character Set Command Error** The character set value specified at the Character Set Selection command (i) was not within the range of **00** through **31.**
53	**User-Defined Character Set Command Error** The User-Defined Character Set command (u) contains a parameter error. This is possibly caused by an incorrect value for *n*, which must be a number from **1** through **8**, or the values for *ca* or *fa* were not within the specified ranges. The value for *ca* must be one of the following 16 hex values: **21**, **22**, **23**, **24**, **25**, **26**, **40**, **5B**, **5C**, **5D**, **5E**, **60**, **7B**, **7C**, **7D**, **7E**; the value for *fa* must be from hex **20** through **FF**.
54-55	Not defined.
56	**Logo Generation Command Error** The parameters for the ILOGO command are incorrect. Logo values of **41**-**49**, **4A**, **4B**, **4C**, **61** and **62** are allowed.
57	**Pixel Expansion Command Error** The parameters for the IPEXP Pixel Expansion Command are incorrect. Expansion values of **1** through **255** are allowed. Horizontal and vertical expansion values must be separated by a comma.
58	**Default Font Command Error** The syntax or parameter(s) for the IFONT,S, command is incorrect.
59	**Vertical Dup Cmd Error** The syntax or parameter(s) for the IREPV is incorrect.
60	**Horizontal Dup Cmd Error** The syntax or parameter(s) for the IREPH is incorrect.
61	Not defined.
62	**PAGE Cmd Error** The syntax or parameter(s) for the IPAGE is incorrect.
63	**TIFF Logo Cmd Error** The syntax or parameter(s) for the ITIFF command is incorrect.
64	Not defined.
65	**Bit Image Plot Cmd Error** The syntax or parameter(s) for the IPLOT command is incorrect.
66	**Load Font Command Error** The syntax or parameter(s) for the ILOAD command is incorrect.
67	**Unsupported Cmd Error** The command is not supported.

A *Standard ASCII Character Set*



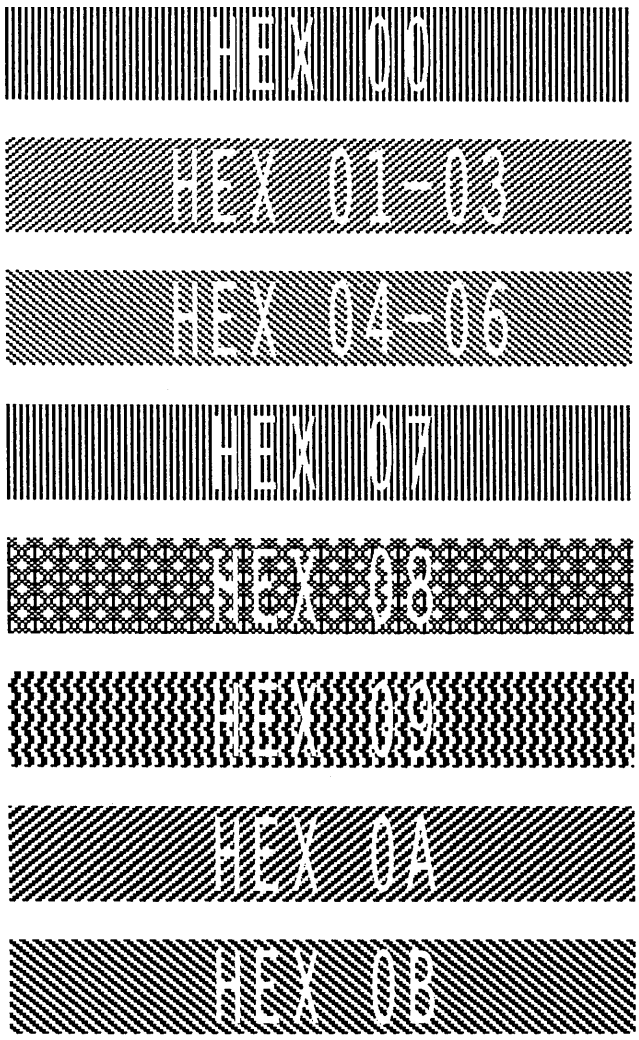
B7 B6 B5 / BITS B4 B3 B2 B1	ROW	0 0 0 / COLUMN 0		0 0 1 / 1		0 1 0 / 2		0 1 1 / 3		1 0 0 / 4		1 0 1 / 5		1 1 0 / 6		1 1 1 / 7	
0 0 0 0	0	NUL	0 0 0	DLE	20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1	1	SOH	1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0	2	STX	2 2 2	DC2	22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1	3	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0	4	EOT	4 4 4	DC4	24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1	5	ENQ	5 5 5	NAK	25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
0 1 1 0	6	ACK	6 6 6	SYN	26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
0 1 1 1	7	BEL	7 7 7	ETB	27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
1 0 0 0	8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
1 0 0 1	9	HT	11 9 9	EM	31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
1 0 1 0	10	LF	12 10 0 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
1 0 1 1	11	VT	13 11 0 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
1 1 0 0	12	FF	14 12 0 C	FS	34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
1 1 0 1	13	CR	15 13 0 D	GS	35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
1 1 1 0	14	SO	16 14 0 E	RS	36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1 1 1 1	15	SI	17 15 0 F	US	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

Appendix A Standard ASCII Character Set

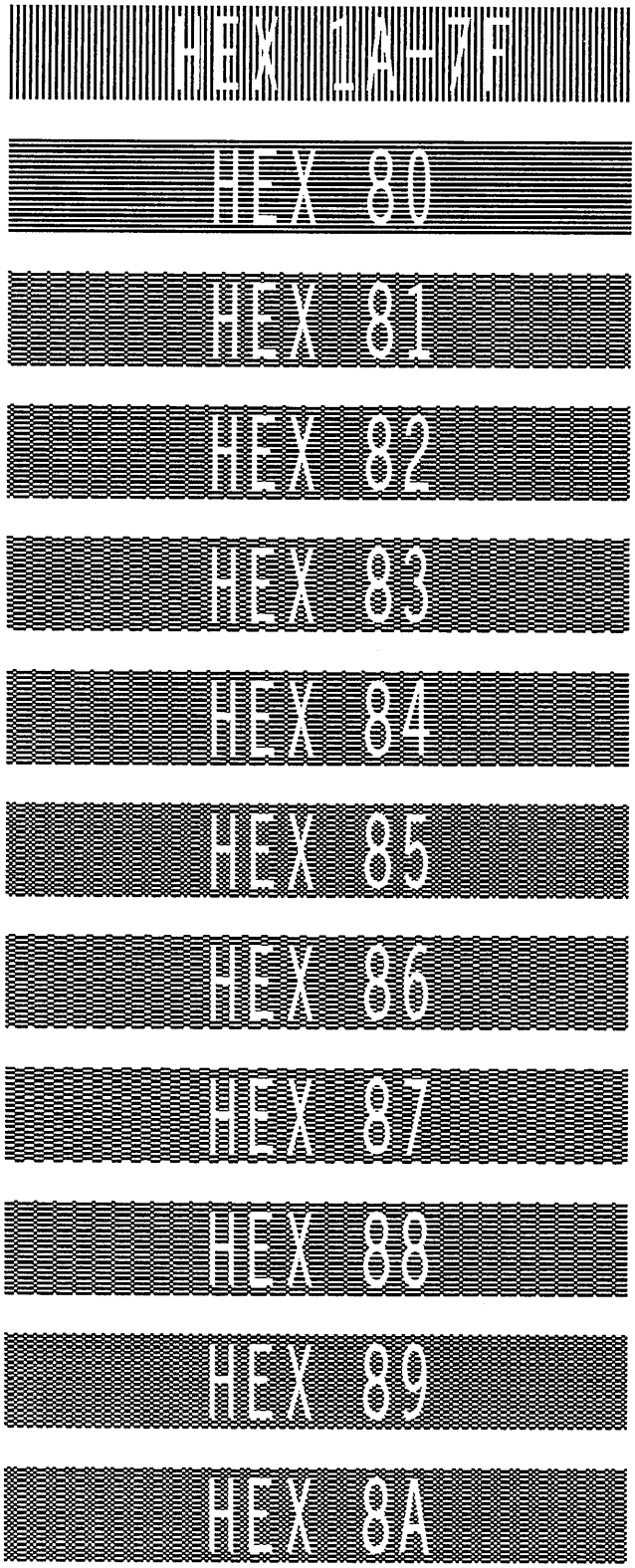
B *Shading Masks*

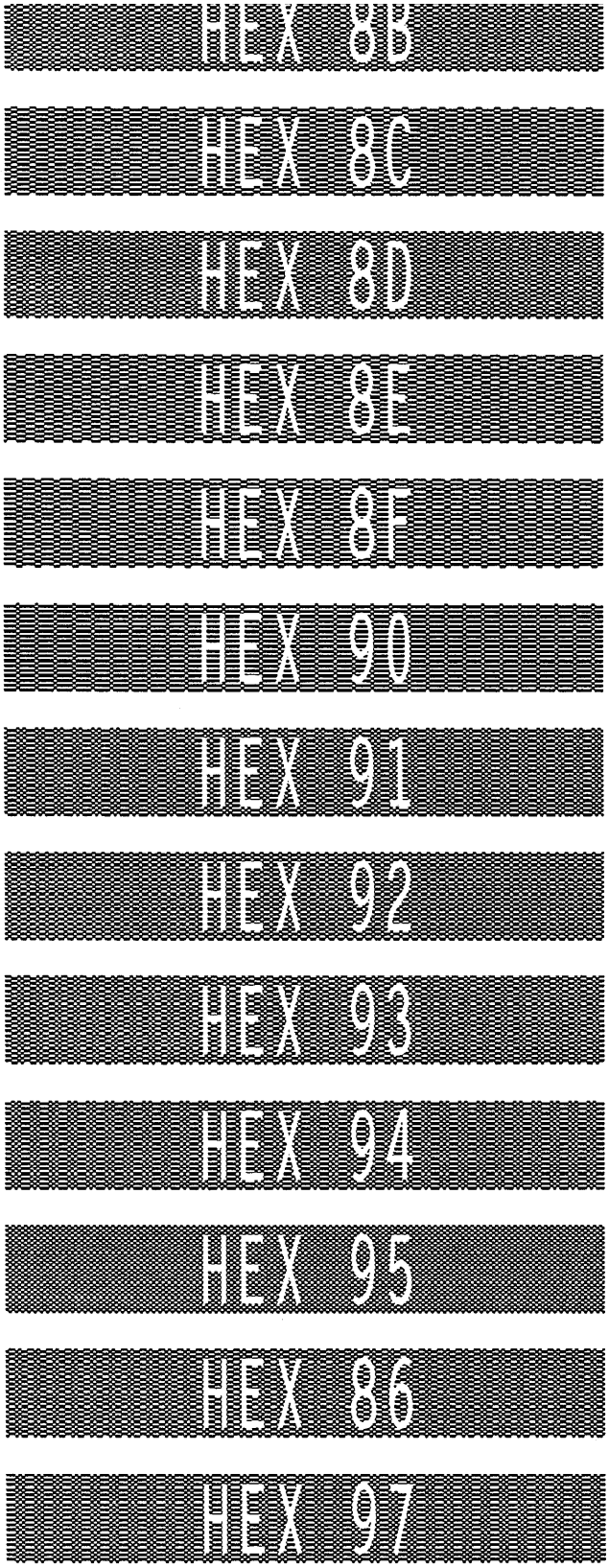
Selecting Masks

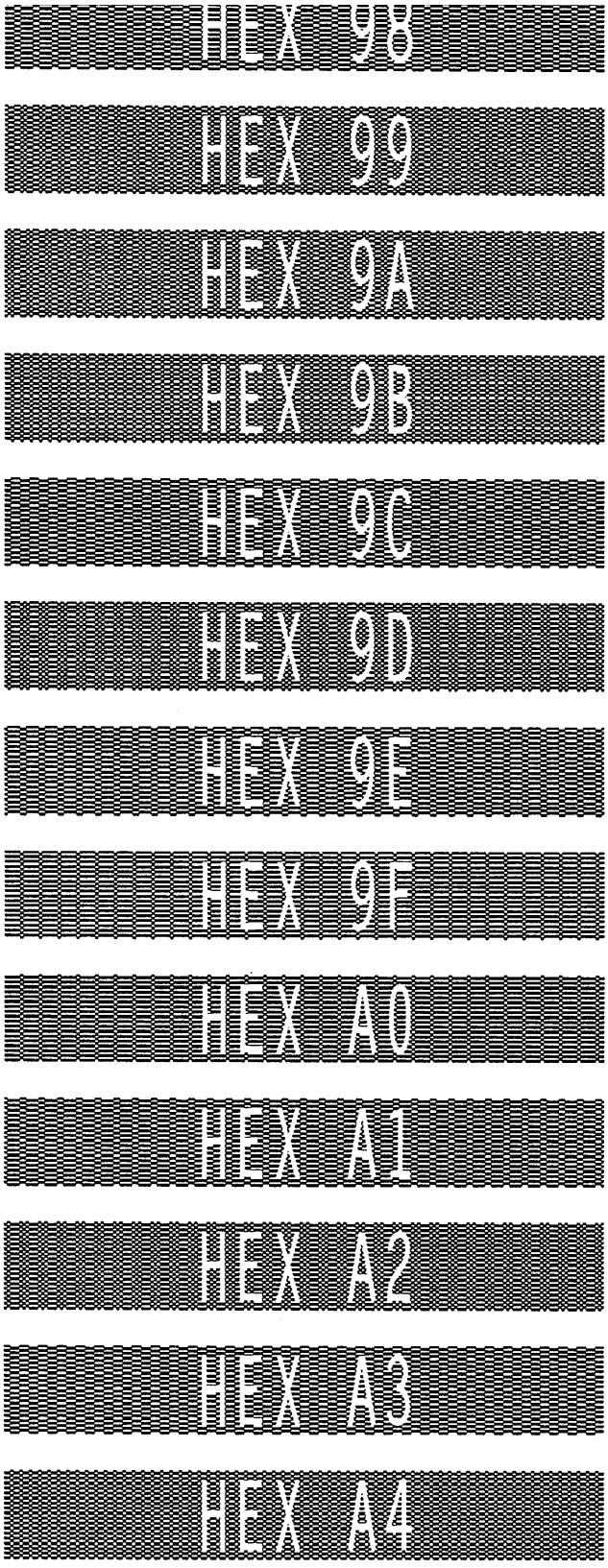
The Shading Mask command (KL), described on page 142 of Chapter 2, includes 132 different shading masks. Print samples of these masks are illustrated below. Each mask is reverse printed with the appropriate hexadecimal mask value. Replace the *mask* parameter in the KL command with one of the following hexadecimal mask values.

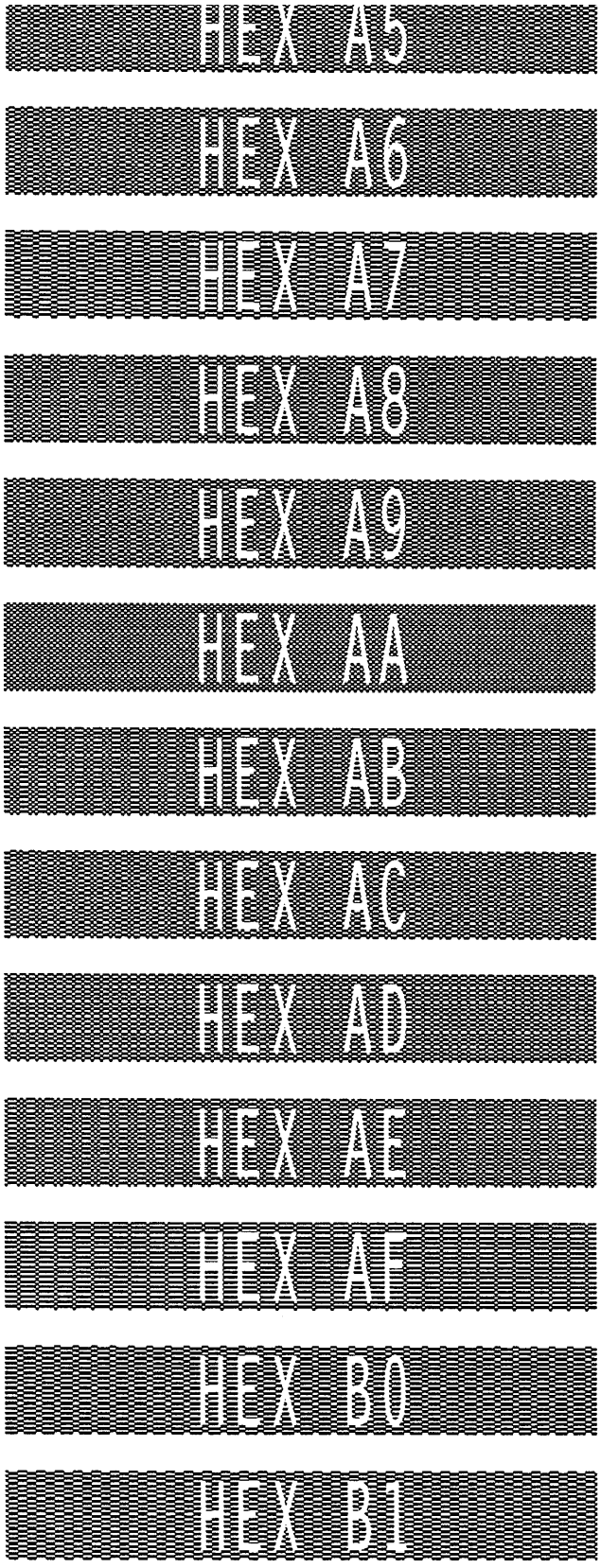


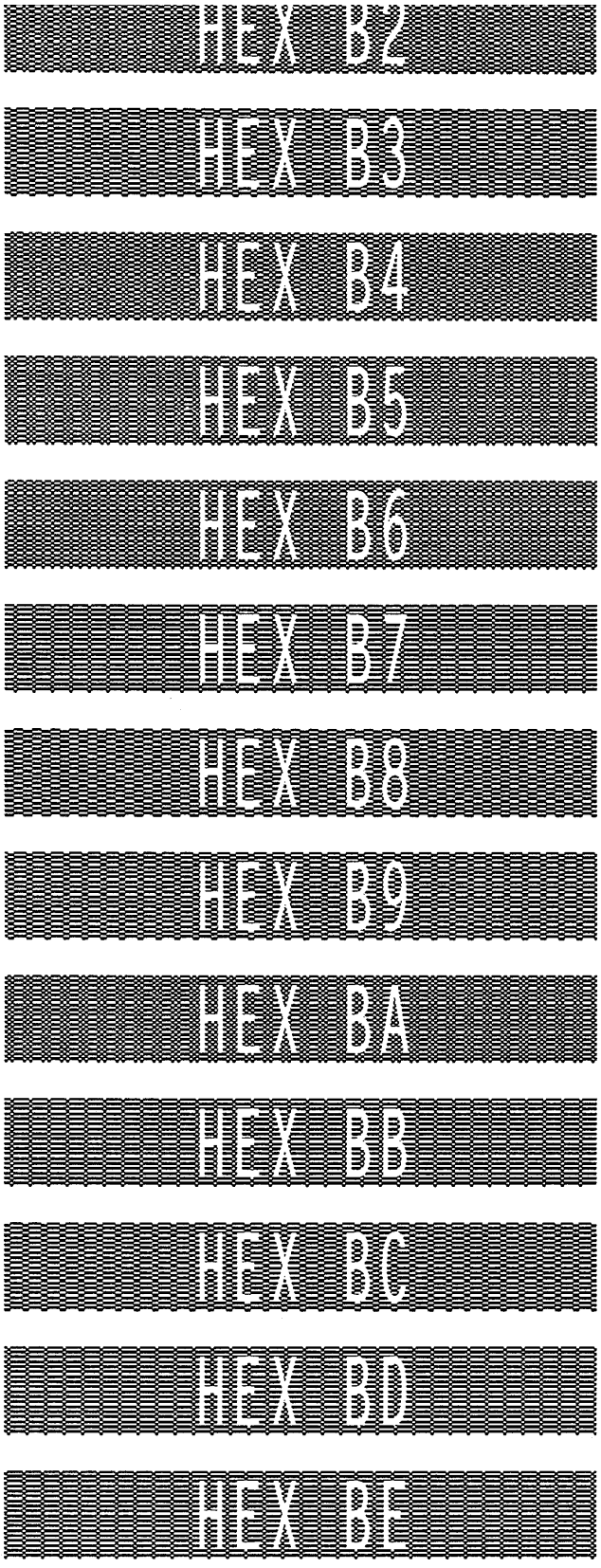
NOTE: Both 18H and 19H produce a white shading mask when printed.

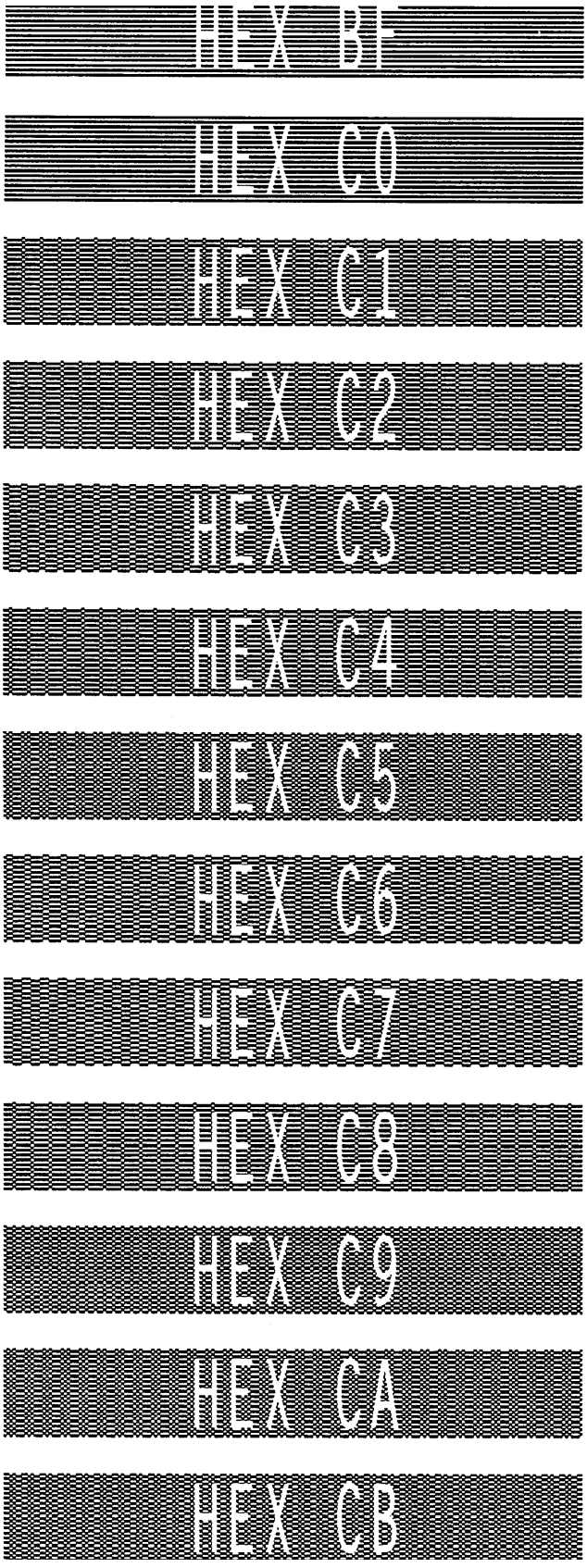

HEX 1A–7F
HEX 80
HEX 81
HEX 82
HEX 83
HEX 84
HEX 85
HEX 86
HEX 87
HEX 88
HEX 89
HEX 8A

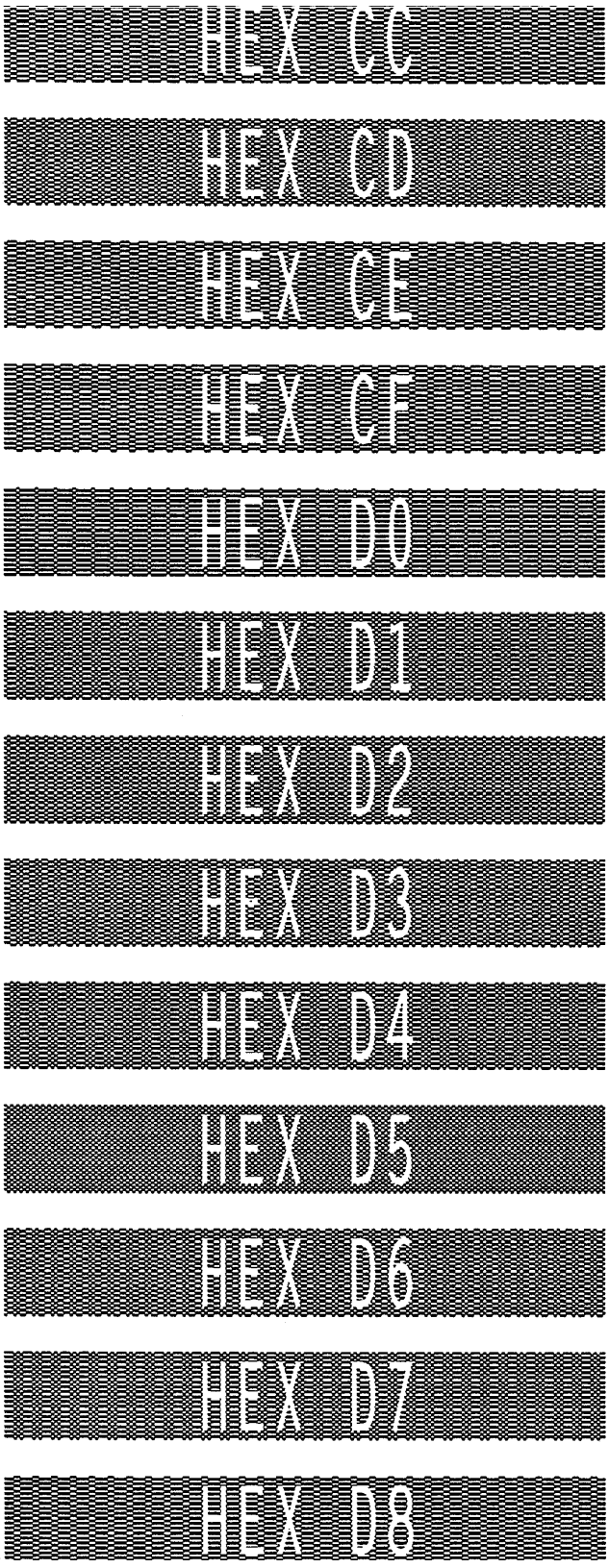

HEX 8B
HEX 8C
HEX 8D
HEX 8E
HEX 8F
HEX 90
HEX 91
HEX 92
HEX 93
HEX 94
HEX 95
HEX 86
HEX 97

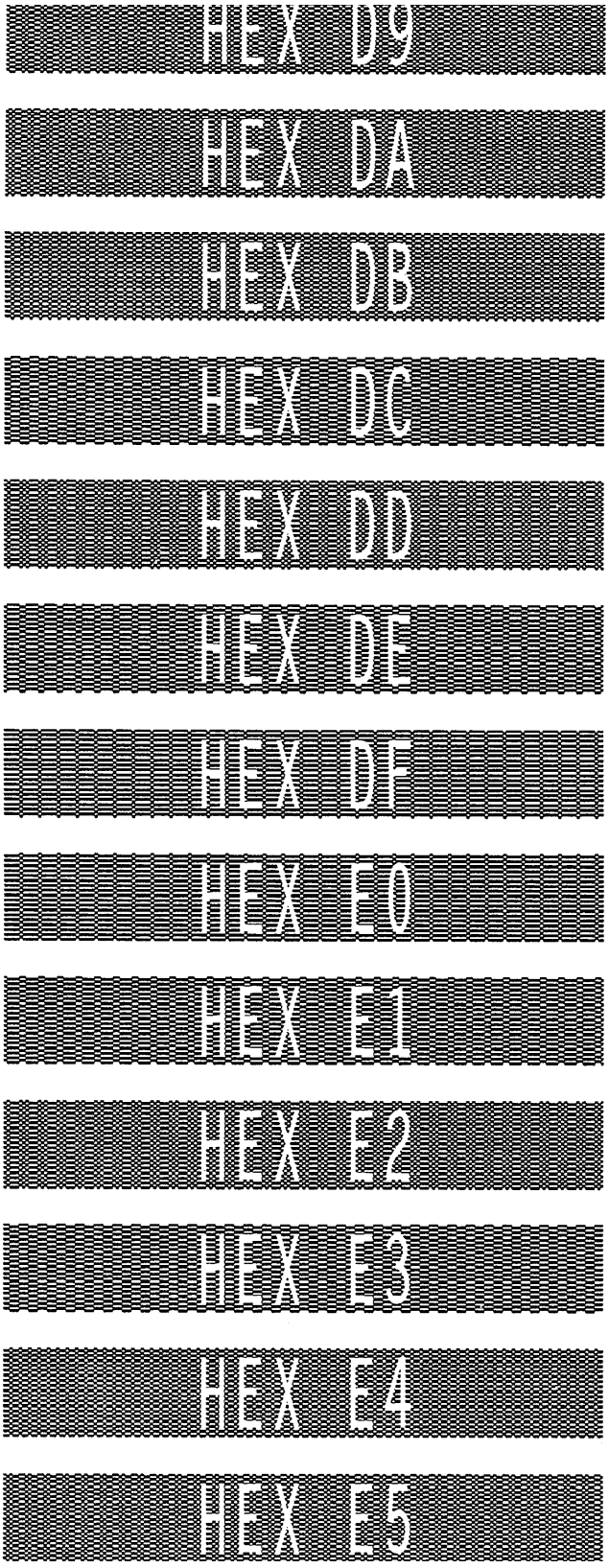

HEX 98
HEX 99
HEX 9A
HEX 9B
HEX 9C
HEX 9D
HEX 9E
HEX 9F
HEX A0
HEX A1
HEX A2
HEX A3
HEX A4

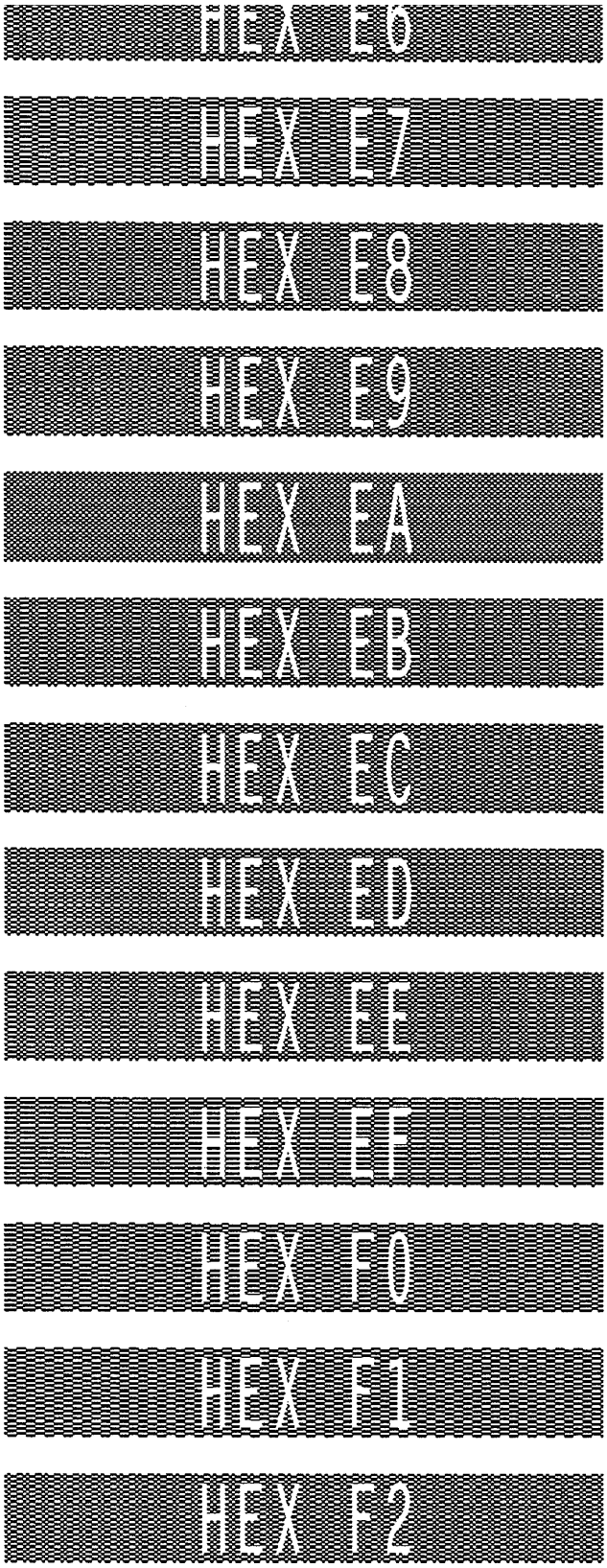

HEX A5
HEX A6
HEX A7
HEX A8
HEX A9
HEX AA
HEX AB
HEX AC
HEX AD
HEX AE
HEX AF
HEX B0
HEX B1

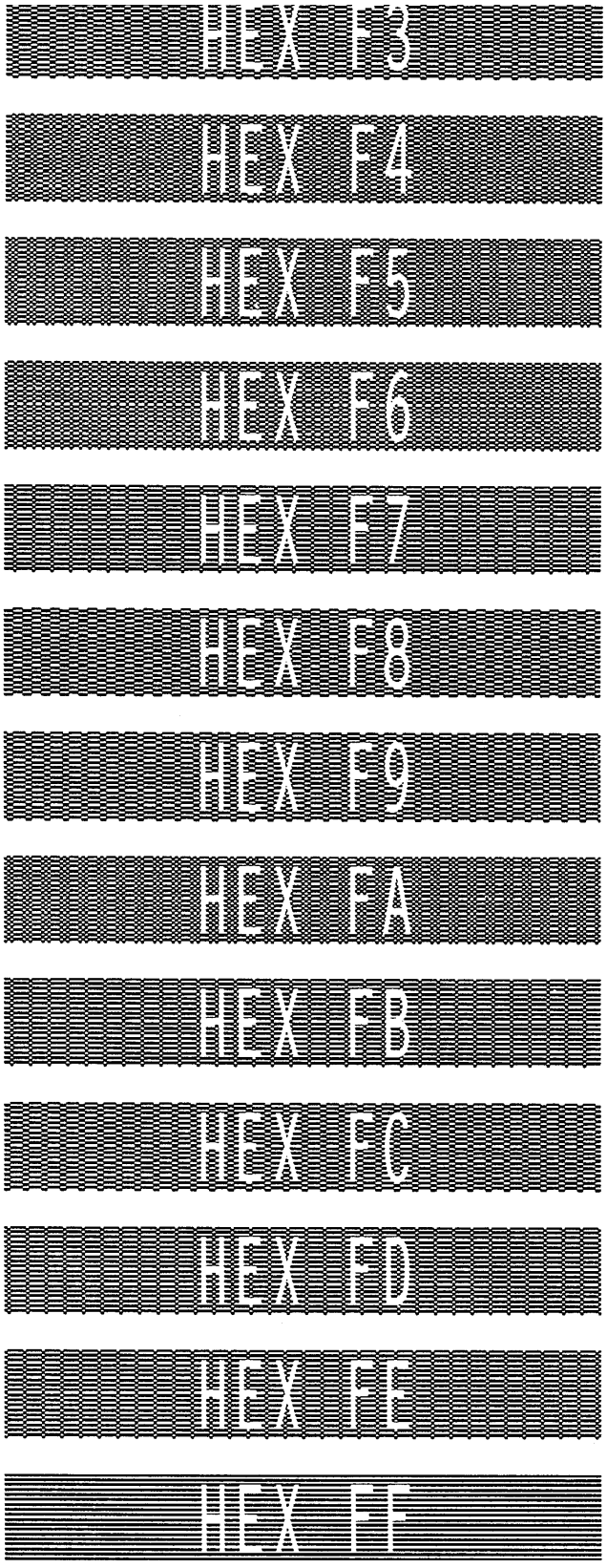

HEX B2
HEX B3
HEX B4
HEX B5
HEX B6
HEX B7
HEX B8
HEX B9
HEX BA
HEX BB
HEX BC
HEX BD
HEX BE


HEX BF
HEX C0
HEX C1
HEX C2
HEX C3
HEX C4
HEX C5
HEX C6
HEX C7
HEX C8
HEX C9
HEX CA
HEX CB


HEX CC
HEX CD
HEX CE
HEX CF
HEX D0
HEX D1
HEX D2
HEX D3
HEX D4
HEX D5
HEX D6
HEX D7
HEX D8


HEX D9
HEX DA
HEX DB
HEX DC
HEX DD
HEX DE
HEX DF
HEX E0
HEX E1
HEX E2
HEX E3
HEX E4
HEX E5

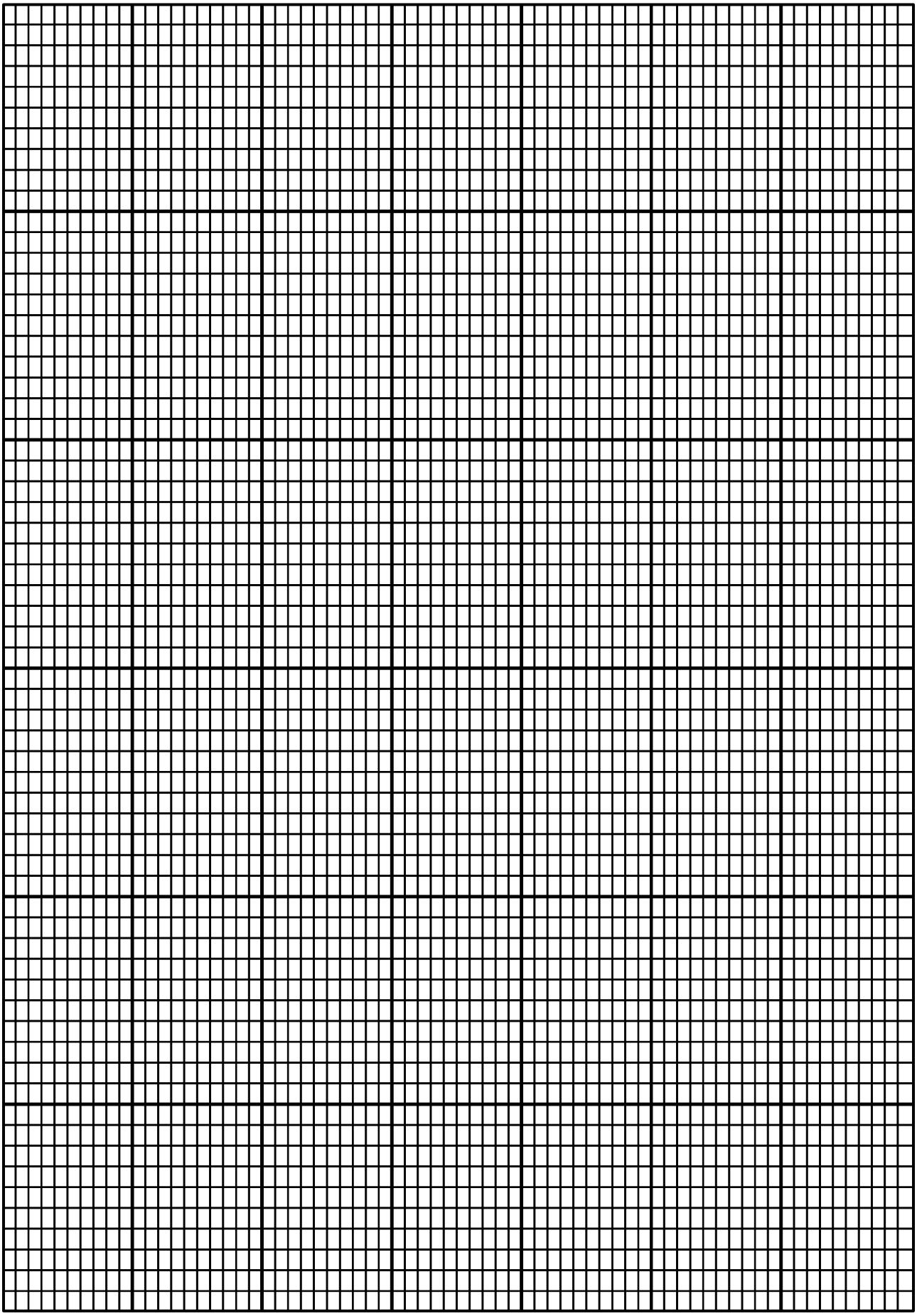

HEX E6
HEX E7
HEX E8
HEX E9
HEX EA
HEX EB
HEX EC
HEX ED
HEX EE
HEX EF
HEX F0
HEX F1
HEX F2

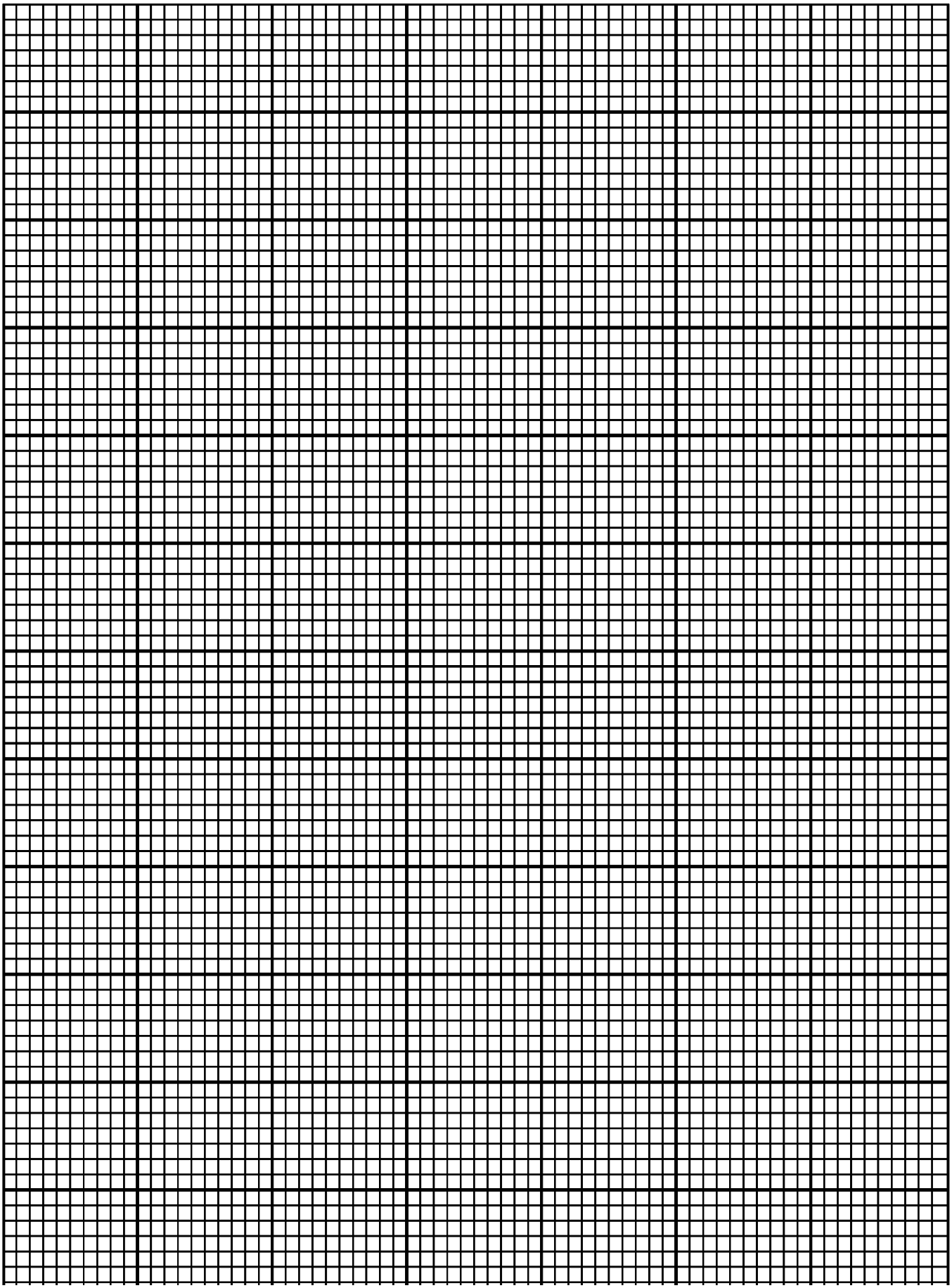

HEX F3
HEX F4
HEX F5
HEX F6
HEX F7
HEX F8
HEX F9
HEX FA
HEX FB
HEX FC
HEX FD
HEX FE
HEX FF

C *Grid Samples*

The **Standard Grid**, shown on page 376, is used to design your form layout. At 6 lines per inch (lpi) and 10 characters per inch (cpi) printing, a standard 8-1/2 x 11-inch sheet of paper has a print area of 66 lines (rows) and 85 characters (columns). (The printable area will vary if you are not printing at 6 lpi and 10 cpi.) Thus, the grid used to design an 8-1/2 x 11-inch form should accommodate this 66 x 85 area.

The **Logo Grid**, shown on page 377, is used to design custom logos. Remember, with the logo grid, you must define the dot positions for each 7-bit *vertical* data byte, and each vertical data byte equals 1/10-inch, or one “row.” Each vertical data byte represents data used in the Plotting Graphics (Columns) command (Q) described on page 129 of Chapter 2. See Chapter 4 for more information on designing a logo.





D *Page Boundaries*

Paper Selection and Maximum Values

Although VGL commands do not require you to identify specific starting and ending points within a command sequence, the limitations imposed by page boundaries should be considered for optimum VGL performance. This appendix addresses the page boundaries affecting VGL products for both cut-sheet page printers and continuous form printers.

Certain print area boundaries exist according to the paper size selected. These boundaries are identified in Table 76. The maximum dot values shown in Table 76 are necessary to determine the maximum printable area on a form when modifying top/bottom margin settings or offsetting for left margin print positions. The following pages explain how to determine your Top/Bottom Margin and Left Margin requirements.

Table 76. Paper Sizes and Maximum Print Area

Paper Size	Dimensions	Maximum Dot Value*	
		Page Width	Page Length
Letter	8.5 x 11	510	792
Legal	8.5 x 14	510	1008
A4	8.268 x 11.693	496	841
B5	6.929 x 9.842	415	708
Computer	13.2 x 11	792	792

*Maximum Dot Values are calculated as follows:
1. Page Length x 72 dpi minus Top and Bottom Margin Values = maximum height value;
2. Page Width x 60 dpi minus Left Margin Value = maximum width value.
Values exceeding maximum values produce an error message.

Setting Top/Bottom Margins

Using dot values to identify maximum vertical print positions, the page boundary parameters of an 11-inch form are 792 dot rows at *n*/72-inch vertically (72 dpi X 11 inches). (See Figure 43.)

With no Top/Bottom Margin configuration setting on an 11-inch form, the first print position is Starting Row 1, Starting Column 1 (A, Figure 43). However, if a Top/Bottom Margin value is set at 10, then the Starting Row 1 is adjusted down by 10 dot rows (B, Figure 43), and the Ending Row is adjusted up 10 dot rows (C, Figure 43), thereby reducing the maximum vertical printable area to 772 dots (792 - [10 + 10]). The greater the top/bottom margin setting, the smaller the printable area on the form.

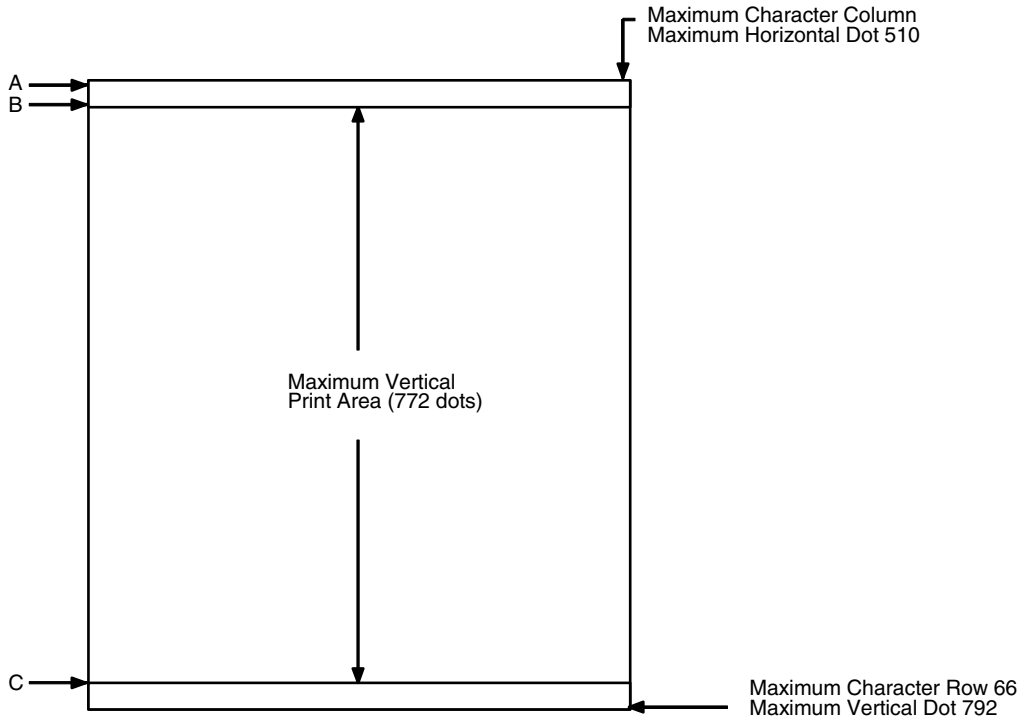


Figure 43. Top/Bottom Margin Example

Setting Left Margins

Using dot values to identify maximum horizontal print positions, the page boundary parameters of an 8-1/2-inch wide form are 510 columns at *n*/60-inch horizontally (60 dpi X 8.5 inches). (See Figure 43.) Setting a Left Margin value repositions the Starting Column 1 position by the degree of offset required. This offset must be a 0 or a positive value. The following examples explain how setting the Left Margin affects printed output:

No Left Margin Setting - When the Left Margin configuration setting is 0 on an 8-1/2-inch form, the Starting Column is 1, and the Ending Column is 510 (Figure 44, A and B, respectively).

Positive Left Margin Setting - When the Left Margin setting is 20 on an 8.5-inch form, the left margin is offset by 20 dots, and that 20th dot position becomes Starting Column 1 in VGL memory (A, Figure 45). This 20 dots also offsets the Ending Column by 20 dots, thus narrowing the maximum print width on the form from 510 to 490 dots (B, Figure 45).

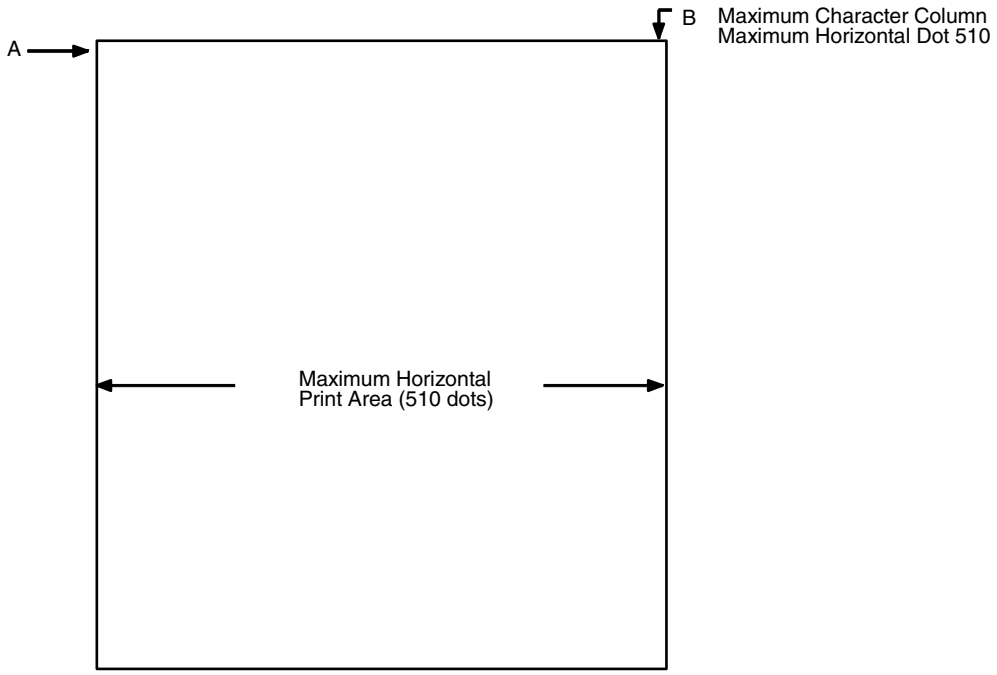


Figure 44. Left Margin Example - No Setting

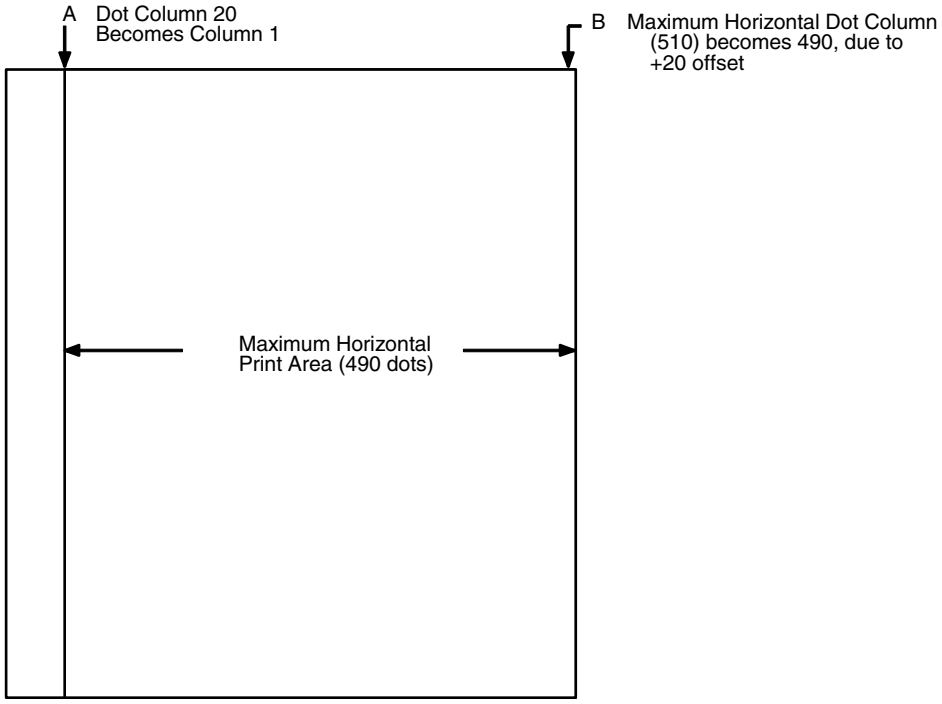


Figure 45. Left Margin Setting +20 Example

E PTX_SETUP Option

Overview

NOTE: PTX_SETUP commands are not supported on L7032 printers.

The PTX_SETUP commands are a superset of commands which allow the printer to perform several tasks by parsing commands either stored in flash or sent to the printer by the host. Commands range from re-routing debug statements to downloading complete printer configurations.

The PTX_SETUP Commands

Some concepts to keep in mind are as follows:

1. PTX_SETUP commands are not emulation specific. In a system with an IGP, the IGP level emulation will process the PTX_SETUP commands. In a system without an IGP, the PTX_SETUP commands will be processed by the base emulation. The CTHI emulation will not process PTX_SETUP commands.
2. Since there is no disk on a flash-based printer, DISK_IO commands are now called FILE_IO. However, for backwards compatibility DISK_IO and FILE_IO are synonymous.
3. The PTX_SETUP command set is case sensitive; all PTX_SETUP commands are in upper case characters only.
4. The white space separating commands may be any number of spaces and tabs. This allows a PTX_SETUP file to be formatted for easier readability.
5. Any unknown command will terminate the PTX_SETUP processing. The offending command will be the first line of printed text.
6. Although the original implementation of PTX_SETUP allowed for only a single parameter, separated from the sub-command by a single semicolon (;) character, the new PTX_SETUP command set allows for multiple parameters separated by commas, semicolons, spaces or tabs.

Commands

Each emulation has modes in which the PTX_SETUP commands could get missed. For this reason, it is highly recommended that all PTX_SETUP commands be placed between print jobs, rather than attempting to imbed them within jobs.

PTX_SETUP commands have the following format:

(SFCC)PTX_SETUP
Command–Sub Command;*Value*
PTR_END

For example, if the SFCC assigned to the emulation you are using is the caret (^, hex 5E), and you wanted to load configuration number 4 and capture all incoming data to a file named “BIN”, you would use the following command:

^PTX_SETUP
CONFIG–LOAD;4 FILE_IO–CAPTURE;BIN
PTR_END

Table 77 lists all the command, sub-command, and parameter combinations and gives a brief description of the command.

NOTE: When a file system error occurs, a message will be displayed on the front panel indicating the error, and the action needed to take to correct the error.

Table 77. PTX_SETUP Commands

Command	Sub-Command	Parameter	Description
CONFIG	LOAD	*Cfg*	*Cfg* can be 0-8. The PTX_SETUP will load configuration *Cfg*. If configuration *Cfg* was not previously saved, the operator panel will display an error message and the current configuration will be kept.
	SAVE	*Cfg*	*Cfg* must be 1-8. This command will save the current configuration as configuration *Cfg*. If *Cfg* is not in the range of 1-8, the command is ignored.
	POWERUP	*Cfg*	Sets the power-up configuration to *Cfg* and loads Configuration *Cfg*. *Cfg* can be any value from 0-8, where 0 is the factory default.
	PRINT	*Cfg*	Print Configuration *Cfg*. *Cfg* can be a number 1-8, or one of four pre-defined configurations. The four non-numeric configurations are requested using the first character for the CURRENT, FACTORY, POWERUP, or ALL configuration(s).
CONFIG	DELETE	*Cfg*	Deletes Configuration number *Cfg. Cfg* must be in the range of 1-8.
	UPLOAD	*Port;Cfg*	This command uploads the configuration stored in location *Cfg* to the port specified by *Port*. *Port* must either be 1284 or SERIAL. *Cfg* may be 1-8 or ALL.
	DOWNLOAD	*Cfg*	This command saves the configuration data that follows as configuration *Cfg. Cfg* must be 1-8 or END.
	RESET		Reboots the printer.
LP MODE	n/a	*Protocol*	*Protocol* must be 0-4. This command resets the software protocol, and is selected as follows: 0 - P-Series 1 - P-Series XQ 2 - Serial Matrix 3 - Proprinter III XL 4 - Epson FX-1050

Table 77. PTX_SETUP Commands (continued)

Command	Sub-Command	Parameter	Description
FILE_IO (DISK_IO)	CAPTURE	*Filename*	Captures all incoming data into a file named *Filename*. Receipt of a FILE_IO–CAPTURE command without the *Filename* parameter will force the file data to be written to flash, and will end the file capture.
	DRIVE	*Letter*	This command is parsed for backwards compatibility. However, since the flash file system is a single device, the drive letter will be ignored.
	DEL	*Filename*	The DEL command will mark a file as deleted. The space the file occupied will be freed the next time the printer is powered up.
FILE_IO (DISK_IO)	RUNFILE	*File;Prop*	The RUNFILE command will open the file named *File* for printing. After the PTR_END command is processed, the contents of *File* will get printed before any more data is read from the host. If the *Prop* field is present, RUNFILE will verify that *Prop* matches the saved file properties. Any mismatch will cause the command to be ignored.
	MAXSIZE	*Kb*	For backwards compatibility.
	MINSIZE	*Kb*	For backwards compatibility.
	FONT	*FontName*	Downloads an HP** LaserJet** font and saves it as *FontName*.
	IFONT	*FontName*	Downloads a scaleable AGFA type font and saves it as *FontName.*

Table 77. PTX_SETUP Commands (continued)

Command	Sub-Command	Parameter	Description
ENGINE	ALM_WIDE	*wide width*	Set the Auto Label Mapping *wide width* (in units of 1/1000”; e.g., a *wide width* value of 1000 = 1”), which represents the width of the image in the file sent from the host which is to be auto label mapped into several labels, each of which will have a width of *narrow width*. # of labels=*wide width/narrow width* (rounded down)
	ALM_NARROW	*narrow width*	Set the Auto Label Mapping *narrow width*, which represents the width of one auto mapped label (in units of 1/1000”; e.g., a *narrow width* value of 1000 = 1”). This width should be set prior to the *wide width*. In addition, it can never exceed the physical width of the printer. If it does, the *narrow width* will be automatically reduced to the Page Width value set in the configuration menu.
	ALM_ENABLE	N/W/*	Set Auto Label Mapping to Narrow, Wide, or Off. Enter N for Narrow, W for Wide, or any other letter to disable ALM. By default, only the Narrow option is implemented.

Table 77. PTX_SETUP Commands (continued)

Command	Sub-Command	Parameter	Description
ENGINE	IMAGE_SHFT_H	*Value*	Shifts the image *Value* horizontally in 1/1000" units. If *Value* is out of the specified range (-1" to +1"), the command will be ignored.
	IMAGE_SHFT_V	*Value*	Shifts the image *Value* vertically in 1/1000" units. If *Value* is out of the specified range (-1" to +6"), the command will be ignored.
	LENGTH	*Value*	Sets the Page Length (in 1/1000" units).
	MEDIA_HANDLING	*Value*	Sets the type of media handling: 0 - Continuous 1 - Tear-Off Strip 2 - Tear-Off 3 - Peel-Off 4 - Cut
	MODE	X	Sets the print mode to Thermal Transfer.
		D	Sets the print mode to Direct Thermal.
	WIDTH	*Value*	Sets the Page Width (in 1/1000" units).
PTR_END	(none)	(none)	Exits the PTX_SETUP.

Summary of the CONFIG Command

The UPLOAD and DOWNLOAD command can be used for uploading and downloading complete printer configurations. If a customer needs to configure 50 printers identically, the customer needs only configure one printer and UPLOAD the configurations. The UPLOADed configurations may then be DOWNLOADed to other printers eliminating the necessity for the operator to configure each printer manually.

The UPLOAD command will always place a header and a footer into the uploaded data. This header will be the DOWNLOAD command followed by the configuration number. The footer will be the DOWNLOAD END command. The operator should be aware that the UPLOAD and DOWNLOAD commands use a secondary copy of the menu structure which does not affect the printer's active configuration. This allows the UPLOAD and DOWNLOAD commands to operate without affecting the printer's current configuration. If the operator intends to use one of the DOWNLOADed configurations, the operator should reboot the printer to ensure proper operation. This can be accomplished by adding the RESET command as the last command in your setup file. This is necessary because the printer caches the active configuration. Rebooting the printer ensures that the desired configuration is correctly read from Non-Volatile RAM.

NOTE: While an upload or download is in progress, the Front Panel will be unavailable.

The Configuration Save and Delete commands from the front panel can be blocked by using the Protect Configurations feature. This is intended to prevent someone from inadvertently reconfiguring a printer. The PTX_SETUP commands, however, will override the protect configurations feature. All PTX_SETUP commands will be honored regardless of the value of the Protect Configurations feature.

Operation of the FILE_IO Command

When a file is opened for writing with the FILE_IO–CAPTURE;*filename* command, the system will allocate RAM for file control blocks and 1 Kbyte for data. If the file already exists on the Flash File System and the Overwrite Enable feature in the Flash File System menu is set to disable, a warning will be displayed on the front panel. After clearing the warning, the file data will be printed. To overwrite the existing file, set the Overwrite Files option to enable.

Due to the nature of writing to flash, any data intended to be stored permanently in flash must first be copied into RAM. As a result, the ability to manipulate files in the Flash File System is dependent upon the printer having sufficient RAM. None of the captured file data will be committed to flash until the entire file is loaded. The PTX_SETUP parser will interpret the command “FILE_IO–CAPTURE<lf>” as an end of file marker. Receipt of the command will cause all file data to be written to flash. The file system allocates RAM for temporary data storage in 1 Kbyte blocks. If at any time during the file download the printer runs out of RAM, a warning will be displayed on the front panel and as much of the file as possible will be saved in flash. To download larger files you may need to add additional RAM to the printer.

Three things can limit the ability to save a file: insufficient RAM, insufficient Flash, and lack of empty file system entries. Flash can only be written once before it needs to be “optimized”. As a result, the maximum file size is limited to the largest unwritten block of Flash. If any of these problems occur, the printer will display an error message and will attempt to provide the operator with a description of what steps to take to correct the error. Normally, the solution will involve optimizing the Flash File System. This can be accomplished by selecting the Optimize & Reboot function in the Flash File System menu under MAINT/MISC.

NOTE: After selecting the Optimize & Reboot function, do not shut off the printer's power until after the printer returns to the power-on state. Loss of power during the optimize process may corrupt the printer's program. If this occurs, first attempt to repeat the downloading process. If that fails, contact an authorized service representative.

F VGL Command Support on L7032 Printers

The following table lists partially supported and non-supported commands on the L7032 printer. For more information on each command, refer to the corresponding page number.

Table 78. L7032 Printers - Partially Supported and Non-Supported Commands

VGL Command	Support Level	Description	Page
IPAGE	Partial	Page, Controlling Paper Options (Version II)	122
!	Not Supported	Send control characters to LP+ (0x01)	53
“	Not Supported	Send control characters to LP+ (0x02)	53
#	Not Supported	Send control characters to LP+ (0x03)	53
$	Not Supported	Send control characters to LP+ (0x04)	53
%	Not Supported	Send control characters to LP+ (0x05)	53
&	Not Supported	Send control characters to LP+ (0x06)	53
‘	Not Supported	Send control characters to LP+ (0x07)	53
(	Not Supported	Send control characters to LP+ (0x08)	53
.	Not Supported	Send control characters to LP+ (0x0E)	53
/	Not Supported	Send control characters to LP+ (0x0F)	53
>	Not Supported	Electronic Vertical Format Unit (EVFU), Start Load	73
?	Not Supported	Electronic Vertical Format Unit (EVFU), End Load	73
0 - 9	Not Supported	Electronic Vertical Format Unit (EVFU), Channel 1 through 10	73
:	Not Supported	Electronic Vertical Format Unit (EVFU), Channel 11	73
;	Not Supported	Electronic Vertical Format Unit (EVFU), Channel 12	73
<	Not Supported	Electronic Vertical Format Unit (EVFU), Channel 13	73

Table 78. L7032 Printers - Partially Supported and Non-Supported Commands

VGL Command	Support Level	Description	Page
=	Not Supported	Electronic Vertical Format Unit (EVFU), Channel 14	73
IEMUL	Not Supported	Emulation Switch	77
@R	Not Supported	Reset	135
+	Not Supported	Tab, Vertical	155
Q	Not Supported	Plotting Graphics	132
C	Not Supported	Plotting Graphics	157

G Glossary

A

Active column — The horizontal location on the paper where the next character prints. After printing a character, the printer advances the active column.

Active line — The vertical location on the paper where the next character prints. After printing a line, the printer advances the active line.

Active position — The position on the paper where the next character prints. The active position is defined by the horizontal position (active column) and the vertical position (active line).

ASCII — Abbreviation of American Standard Code for Information Interchange.

B

Baud — A unit of speed that measures the rate at which information is transferred. Baud rate is the reciprocal of the length in seconds of the shortest pulse used to carry data. For example, a system in which the shortest pulse is 1/1200 second operates at 1200 baud. On RS-232 serial lines, the baud rate equals the data flow rate in bits per second (bps). To communicate properly, a printer must be configured to operate at the same baud rate as its host computer.

Bold — A typeface with a heavy line thickness produced by a double strike print method. *See also* character weight. *Compare with* shadow printing.

Buffer — A reserved area in printer memory that data is written to and read from during data transfers.

C

Character	A graphical representation of data.
Character cell	The invisible rectangular space occupied by a character, including the white space around the character. Used as a unit of spacing. The height of a cell is equal to the current line spacing, and the width of a cell remains constant even with changes in the current character spacing.
Character Library	The collection of all the glyphs for all fonts.
Character Location	The location of a character in a font. The location of a character is the same in all fonts.
Character set	A protocol instructing the printer how to construct a set of printable characters, including symbols, punctuation, numbers, diacritical markings, and alphabet characters. Each character is assigned a unique address in memory.
Character weight	The degree of lightness and thickness of printed text. For example: Bold refers to a heavy or thick character weight. Medium, normal, or book weight refer to the character weight used in this sentence.
Code Point	A value between 0 and 256 that defines the location of a character within a character set.
Command sequence	Two or more bytes that instruct the printer to perform a special function. The first character in the sequence is a Special Function Control Character (SFCC), which alerts the printer that the string is a command sequence. (*See also* SFCC.)
Compressed	A font attribute referring to a typeface with a smaller than normal character width, but no change to character height.
cpi	characters per inch: a measurement of monospaced fonts indicating the horizontal character density. For example, 10 cpi is 10 characters produced in a one-inch (horizontal) space.
CSI	Control Sequence Introducer: Two or more bytes that describe a specific printer control function. In a control sequence, the first byte is always the CSI character.

D

Decipoint	One tenth of a point. A unit of measurement equal to 1/720 inch. *See also* point.
Default	A value, parameter, attribute, or option assigned by a program or system when another is not specified by the user.
Diagnostic	Pertains to the detection and isolation of printer malfunctions or mistakes.
Disable	To deactivate or set to OFF.

E

Em	A font width term equal to the maximum character width obtainable in a given font. (Derived from the width of an uppercase M, usually the widest character in a set.)
Emulation	Refers to the ability of a printer to execute the commands of another printer language or protocol.
En	A font width term equal to one half em.
Enable	To activate or set to ON.
Escape sequence	Two or more bytes that describe a specific printer control function. In an escape sequence, the first byte is always the ASCII ESC character. (*See also* command sequence, SFCC.)
Expanded	A font enhancement referring to larger-than-normal character width with no change in character height.

F

False	Off or zero. *Compare with* true.
Family (or type)	A set of all variations and sizes of a type style.
Fixed-pitch fonts	*See* font, monospaced.

Font	The complete set of a given size of type, including characters, symbols, figures, punctuation marks, ligatures, signs, and accents. To fully describe a font, you must specify seven characteristics: 1) type family, 2) spacing (proportional or monospaced), 3) type size (12 point, 14 point, etc.), 4) scale factor (character height/width ratio), 5) type style, 6) character weight, and 7) character proportion (normal, condensed, expanded).
Font Directory	The header file that contains the tables describing allowed the mode and pitch combinations. The file also contains the tables used to set up the character sets and the international languages within the character sets.
Font name	*See* typeface.
Font pattern	A font pattern is the matrix of pels which represents a character, symbol, or image.
Font, landscape	A font printed parallel to the long edge of a page, or a font capable of being produced on a landscape page orientation.
Font, monospaced	Also called fixed-pitch fonts. Every character, regardless of actual horizontal size, occupies the same amount of font pattern space. All monospaced fonts use specific pitch size settings. Monospaced fonts are sometimes used when strict character alignment is desired (tables, charts, spreadsheets, etc.).
Font, portrait	A font printed parallel to the short edge of a page.
Font, proportional	A font in which the width of the character cell varies with the width of the character. For example, “i” takes less space to print than “m”. Using proportional fonts generally increases the readability of printed documents, giving text a typeset appearance. This manual is printed in proportional fonts.
Font weight	*See* character weight.
Font width	The measurement of the width of a character cell in dots.

G

Glyph	The shape of a character in a print mode and pitch.

H

HGS	Horizontal Grid Size.
Host computer	The host computer stores, processes, and sends data to be printed, and which communicates directly with the printer. The term host indicates the controlling computer, since modern printers are themselves microprocessor-controlled computer systems.

I

ipm	inches per minute: The speed at which graphics are plotted.
Interface	The hardware components used to link two devices by common physical interconnection, signal, and functional characteristics.
International Language	Character set in which characters have been rearranged according to a substitution table for use in a different country.
Invoke	To put into effect or operation.
Italic	A type style in which characters are slanted. *This sentence is set in italics.*

L

lpi	lines per inch: a measurement indicating the vertical spacing between successive lines of text. For example, 8 lpi is 8 printed lines per vertical inch.
lpm	lines per minute: A measurement indicating the number of lines printed per minute. (lpm usually defines the speed at which text prints.)
Logical link	The parameters that specify data transfer, control, or communication operations.

M

Memory	*See* RAM.

N

Nonvolatile memory	Nonvolatile memory stores variables that must be preserved when the printer is turned off, such as configuration parameters and printer usage statistics. Nonvolatile memory is preserved because RAM is housed on the controller board, which contains an independent, battery-operated power supply. When printer power is turned off, the battery supplies the power needed to keep stored data active. Nonvolatile memory also includes storage on disk.
NOVRAM	Acronym of NonVolatile Random-Access Memory. *See also* nonvolatile memory.

O

OCR	Optical Character Recognition is the process by which a machine reads characters printed in a special standardized font. Data are read by a photoelectric optical scanner and recorded on magnetic tape or disk. OCR-A and OCR-B are two widely used fonts.

P

Page Window	A rectangular area on the physical page outside of which the emulation does not print.
Parity (check)	Parity checking is the addition of non-data bits to data, resulting in the number of 1 bits being either always even or always odd. Parity is used to detect transmission errors. Parity represents the value in the check digit of the received or transmitted data.

Parsing	Parsing is the process of separating a programming statement into basic units that can be translated into machine instructions. A printer can recover from an erroneous code sequence by performing as much of the function as possible or, parsing the valid parameter from the invalid.
Pel	*See* pixel.
PI	Paper instruction: A signal from the host with the same timing and polarity as the data lines.
Pica	A name indicating a monospaced font with a pitch of 10 cpi and usually a 12 point height. Pica is also used in typography as a unit of measurement: 1 pica = 1/6 inch .
Pin configuration	Establishes the physical attachment and protocol conversion connections for the host interface.
Pitch	The number of text characters printed per horizontal inch. Specified in characters per inch or cpi.
Pixel	Acronym of picture element or picture cell. The smallest displayable picture element on a video monitor or printable unit in a printer.
Point	A unit of measure in printing and typography, used to specify type sizes, heights of font characters, etc. There are 72 points in a vertical inch; thus, one point equals 1/72 inch, or approximately 0.0138 inch. Examples; This is 6 point type. This is 10 point type. This is 16 point type.
Port	A channel used for receiving data from or transmitting data to one or more external devices.
Print Mode	The horizontal and vertical dot density at which the characters are printed.
Print Pitch	Defines the number of characters that can be printed in one inch. It can be translated into the width of the character.
Printer Configuration	The operating properties that define how the printer responds to signals and commands received from the host computer. These properties are set to match the operating characteristics of the host computer system.
Printer Interface	The point where the data line from the host computer plugs into the printer.

Protocol	A set of rules or conventions governing the exchange of information between computer systems. For computer printers, a protocol is the coding convention used to convey and print data. A printer protocol includes character codes, printer function codes, and machine-to-machine communication codes.

R

RAM	Random-Access Memory. Also called “main memory” or “working memory,” this is the active memory of a printer, into which programs are loaded. RAM is said to be volatile because data in RAM are lost when power is turned off or interrupted. *Compare with* ROM.
Read	To retrieve data from memory or mass storage (hard disk, floppy diskette, RAM, etc.).
Reset	To turn off, deactivate, disable, or return to a previous state.
Resolution	A measure expressing the number of component units in a given range used to create an image; in printing, expressed as the number of dots per inch (dpi) horizontally and vertically.
ROM	Read-Only Memory. Programs, instructions, and routines permanently stored in the printer. ROM is not lost when power is turned off and cannot be written to-hence the name “read only.” ROM-resident fonts are permanently stored in a printer and available at any time via software commands. *Compare with* RAM.
Roman	A type style in which characters are upright. This sentence is printed in roman type.

S

Serial communications	The sequential transmission of data, in which each element is transferred in succession.
Set	To turn on, activate, invoke, or enable.
SFCC	Special Function Control Character. The first character in a printer command sequence. In P-Series emulation mode, you can select one of five characters as the SFCC. In the Serial Matrix or Proprinter protocols, the SFCC must always be the ASCII ESC character. *See also* command sequence.
Shadow printing	A typeface with a heavy line thickness produced when the characters doublestrike just offset of the original characters. *See also* character weight. *Compare with* bold print.
Sixel	A six pixel vertical column.
Slewing	Rapid vertical paper movement.
SSCC	Super-Set Control Code. The SSCC is used to activate the super-set commands. It consists of the SFCC plus the sequence | } ;
Start bit	The signal that indicates the start of a character or element.
Stop bits	The signal that indicates the end of a character or element.
String	Two or more bytes of data or code treated as a unit.
Substitution Table	A table that contains the code points within a character set that need to be changed for an international language.
Symbol set	*See* character set.

T

True	On or 1. “High true” refers to a positive relative voltage representing the ON state; “low true” refers to a negative relative voltage representing the ON state.
Type style	Refers to either the upright (roman) or italic character style within a specific font family.
Typeface	A descriptive name or brand name that identifies a particular design of type.
Typographic font	*See* font, proportional.

W

Weight	*See* character weight.
Write	To store data to memory or mass storage (hard disk, floppy diskette, RAM, etc.).

H Contact Information

Printronix Customer Support Center

IMPORTANT **Please have the following information available prior to calling the Printronix Customer Support Center:**

- Model number
- Serial number (located on the back of the printer)
- Installed options (i.e., interface and host type if applicable to the problem)
- Configuration printout:

  Thermal Printer
  See “Printing A Configuration” in the *Quick Setup Guide*.

  Line Matrix Printer
  Press PRT CONFIG on the control panel, then press Enter.

  L7032 Printer

  a. Press the Menu button.
  b. Press the Left or Right arrow button until Test Print displays.
  c. Press the Down arrow button to select the menu.
  d. If necessary, press the Left or Right arrow button until Configuration displays.
  e. Press Shift + Down arrow to select the menu option and print the current configuration.
- Is the problem with a new install or an existing printer?
- Description of the problem (be specific)
- Good and bad samples that clearly show the problem (faxing or emailing of these samples may be required)

Americas	(714) 368-2686
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China	(86) 800-999-6836

http://www.printronix.com/support.aspx

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